

TABLE 2-5 REPRESENTATIVE BIRD SPECIES POTENTIALLY OCCURRING WITHIN THE STUDY AREA

Scientific Name	Common Name	Year-Round Resident	Summer Resident	Winter Resident	Temporary Migrant
<i>Baeolophus atricristatus</i>	Black-crested titmouse	X			
PASSERIFORMES: Parulidae					
<i>Cardellina pusilla</i>	Wilson's warbler				X
<i>Geothlypis tolmiei</i>	MacGillivray's warbler				X
<i>Geothlypis trichas</i>	Common yellowthroat		X	X	X
<i>Icteria virens</i>	Yellow-breasted chat		X		X
<i>Oreothlypis celata</i>	Orange-crowned warbler			X	X
<i>Oreothlypis ruficapilla</i>	Nashville warbler				X
<i>Setophaga coronata</i>	Yellow-rumped warbler			X	X
<i>Setophaga petechia</i>	Yellow warbler				X
PASSERIFORMES: Passeridae					
<i>Passer domesticus</i>	House sparrow	X			
PASSERIFORMES: Polioptilidae					
<i>Polioptila caerulea</i>	Blue-gray gnatcatcher		X	X	X
<i>Polioptila melanura</i>	Black-tailed gnatcatcher	X			
PASSERIFORMES: Ptilionotidae					
<i>Phainopepla nitens</i>	Phainopepla		X	X	
PASSERIFORMES: Regulidae					
<i>Regulus calendula</i>	Ruby-crowned kinglet			X	X
PASSERIFORMES: Remizidae					
<i>Auriparus flaviceps</i>	Verdin	X			
PASSERIFORMES: Sittidae					
<i>Sitta canadensis</i>	Red-breasted nuthatch			X	
<i>Sitta carolinensis</i>	White-breasted nuthatch			X	
PASSERIFORMES: Sturnidae					
<i>Sturnus vulgaris</i>	European starling	X			
PASSERIFORMES: Troglodytidae					
<i>Campylorhynchus brunneicapillus</i>	Cactus wren	X			
<i>Catherpes mexicanus</i>	Canyon wren	X			
<i>Cistothorus palustris</i>	Marsh wren			X	X
<i>Salpinctes obsoletus</i>	Rock wren	X			
<i>Thryomanes bewickii</i>	Bewick's wren	X			
<i>Troglodytes aedon</i>	House wren			X	X
PASSERIFORMES: Turdidae					
<i>Catharus guttatus</i>	Hermit thrush	X			X
<i>Sialia currucoides</i>	Mountain bluebird			X	X
<i>Sialia mexicana</i>	Western bluebird			X	
<i>Turdus migratorius</i>	American robin			X	X
PASSERIFORMES: Tyrannidae					
<i>Contopus sordidulus</i>	Western wood-pewee				X
<i>Empidonax oberholseri</i>	Dusky flycatcher				X

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Scientific Name	Common Name	Year-Round Resident	Summer Resident	Winter Resident	Temporary Migrant
<i>Empidonax traillii</i>	Willow flycatcher				X
<i>Empidonax wrightii</i>	Gray flycatcher		X		
<i>Myiarchus cinerascens</i>	Ash-throated flycatcher		X		
<i>Pyrocephalus rubinus</i>	Vermilion flycatcher	X	X		
<i>Sayornis nigricans</i>	Black phoebe	X			
<i>Sayornis saya</i>	Say's phoebe	X			
<i>Tyrannus forficatus</i>	Scissor-tailed flycatcher		X		
<i>Tyrannus verticalis</i>	Western kingbird		X		
<i>Tyrannus vociferans</i>	Cassin's kingbird		X		
PASSERIFORMES: Vireonidae					
<i>Vireo bellii</i>	Bell's vireo		X		
<i>Vireo plumbeus</i>	Plumbeous vireo				X
<i>Vireo vicinior</i>	Gray vireo		X		
PELECANIFORMES: Ardeidae					
<i>Ardea alba</i>	Great egret		X		
<i>Ardea herodias</i>	Great blue heron	X			
<i>Bubulcus ibis</i>	Cattle egret			X	X
<i>Butorides virescens</i>	Green heron		X		
<i>Nycticorax nycticorax</i>	Black-crowned night-heron		X		
PELECANIFORMES: Threskiornithidae					
<i>Plegadis chihi</i>	White-faced ibis				X
PICIFORMES: Picidae					
<i>Colaptes auratus</i>	Northern flicker			X	
<i>Melanerpes aurifrons</i>	Golden-fronted woodpecker	X			
<i>Picoides scalaris</i>	Ladder-backed woodpecker	X			
<i>Sphyrapicus nuchalis</i>	Red-naped sapsucker			X	
PODICIPEDIFORMES: Podicipedidae					
<i>Aechmophorus clarkii</i>	Clark's grebe			X	
<i>Aechmophorus occidentalis</i>	Western grebe			X	
<i>Podiceps nigricollis</i>	Eared grebe			X	
<i>Podilymbus podiceps</i>	Pied-billed grebe			X	
STRIGIFORMES: Strigidae					
<i>Athene cunicularia</i>	Burrowing owl		X		
<i>Bubo virginianus</i>	Great horned owl	X			
<i>Megascops kennicottii</i>	Western screech-owl	X			
STRIGIFORMES: Tytonidae					
<i>Tyto alba</i>	Barn owl	X			
SULIFORMES: Phalacrocoracidae					
<i>Phalacrocorax auritus</i>	Double-crested cormorant			X	

Source: Bryan 2002; Lockwood and Freeman 2014.

Mammals that may potentially occur in the study area are listed in Table 2-6 (Schmidly and Bradley 2016). The occurrence of each species will be dependent on suitable habitat available with some species, such as bats, migrating through the study area.

TABLE 2-6 REPRESENTATIVE MAMMALIAN SPECIES POTENTIALLY OCCURRING WITHIN THE STUDY AREA

SCIENTIFIC NAME	COMMON NAME
<i>Ammospermophilus interpres</i>	Texas antelope squirrel
<i>Antilocapra americana</i>	Pronghorn
<i>Antrozous pallidus</i>	Pallid bat
<i>Bassariscus astutus</i>	Ringtail
<i>Canis latrans</i>	Coyote
<i>Cervis canadensis</i>	Elk
<i>Chaetodipus eremicus</i>	Chihuahuan desert pocket mouse
<i>Chaetodipus hispidus</i>	Hispid pocket mouse
<i>Chaetodipus nelsoni</i>	Nelson's pocket mouse
<i>Conepatus leuconotus</i>	Hog-nosed skunk
<i>Cratogeomys castanops</i>	Yellow-faced pocket gopher
<i>Cynomys ludovicianus</i>	Black-tailed prairie dog
<i>Dasypus novemcinctus</i>	Nine-banded armadillo
<i>Didelphis virginiana</i>	Virginia opossum
<i>Dipodomys merriami</i>	Merriam's kangaroo rat
<i>Dipodomys ordii</i>	Ord's kangaroo rat
<i>Dipodomys spectabilis</i>	Banner-tailed kangaroo rat
<i>Erethizon dorsatum</i>	Porcupine
<i>Ictidomys parvidens</i>	Rio Grande ground squirrel
<i>Lasionycteris noctivagans</i>	Silver-haired bat
<i>Lasiurus borealis</i>	Eastern red bat
<i>Lasiurus cinereus</i>	Hoary bat
<i>Lepus californicus</i>	Black-tailed jackrabbit
<i>Lynx rufus</i>	Bobcat
<i>Mephitis macroura</i>	Hooded skunk
<i>Mephitis mephitis</i>	Striped skunk
<i>Mus musculus</i>	House mouse
<i>Mustela frenata</i>	Long-tailed weasel
<i>Myotis velifer</i>	Cave myotis bat
<i>Myotis yumanensis</i>	Yuma myotis bat
<i>Neotoma leucodon</i>	White-toothed woodrat
<i>Neotoma micropus</i>	Southern plains woodrat
<i>Notiosorex crawfordi</i>	Crawford's desert shrew
<i>Nyctinomops macrotis</i>	Big free-tailed bat
<i>Odocoileus hemionus</i>	Mule deer
<i>Odocoileus virginianus</i>	White-tailed deer
<i>Onychomys arenicola</i>	Chihuahuan grasshopper mouse
<i>Onychomys leucogaster</i>	Northern grasshopper mouse
<i>Parastrellus hesperus</i>	American parastrelle bat
<i>Perimyotis subflavus</i>	American perimyotis
<i>Perognathus flavus</i>	Silky pocket mouse

TABLE 2-6 REPRESENTATIVE MAMMALIAN SPECIES POTENTIALLY OCCURRING WITHIN THE STUDY AREA

SCIENTIFIC NAME	COMMON NAME
<i>Perognathus merriami</i>	Merriam's pocket mouse
<i>Peromyscus eremicus</i>	Cactus deer mouse
<i>Peromyscus laceianus</i>	Lacey's white-ankled deer mouse
<i>Peromyscus leucopus</i>	White-footed mouse
<i>Peromyscus maniculatus</i>	North American deer mouse
<i>Plecotus townsendii</i>	Townsend's big-eared bat
<i>Procyon lotor</i>	Northern raccoon
<i>Puma concolor</i>	Mountain lion
<i>Rattus norvegicus</i>	Norway rat
<i>Rattus rattus</i>	Roof rat
<i>Reithrodontomys fulvescens</i>	Fulvous harvest mouse
<i>Reithrodontomys megalotis</i>	Western harvest mouse
<i>Reithrodontomys montanus</i>	Plains harvest mouse
<i>Sigmodon hispidus</i>	Hispid cotton rat
<i>Spermophilus variegatus</i>	Rock squirrel
<i>Spilogale gracilis</i>	Western spotted skunk
<i>Sus scrofa</i>	Feral pig
<i>Sylvilagus audubonii</i>	Desert cottontail rabbit
<i>Sylvilagus floridanus</i>	Eastern cottontail rabbit
<i>Tadarida brasiliensis</i>	Brazilian free-tailed bat
<i>Taxidea taxus</i>	American badger
<i>Tayassu tajacu</i>	Collared peccary
<i>Thomomys bottae</i>	Botta's pocket gopher
<i>Urocyon cinereoargenteus</i>	Common gray fox
<i>Ursus americanus</i>	American black-bear
<i>Vulpes macrotis</i>	Kit fox
<i>Vulpes vulpes</i>	Red fox
<i>Xerospermophilus spilosoma</i>	Spotted ground squirrel

Source: Schmidly and Bradley 2016.

2.2.5.3 Aquatic Habitat

Mapped wetlands information was incorporated for the study area from the USFWS' NWI database (USFWS 2018a). NWI maps are based on topography and interpretation of infrared satellite data and color aerial photographs and are classified under the Cowardin System (Cowardin et al. 1979). NWI wetlands types identified within the study area include freshwater palustrine emergent (PEM), forested/shrub (PSS), and ponds. PEM wetlands are primarily associated with depressional areas and along the margins of open water areas. PSS wetlands exist typically in depressional or riparian areas near streams, draws, and ponds. Mapped ponds and lakes are typically associated with shallow freshwater stock ponds, retention ponds, and other small impoundments.

Perennial and intermittent streams, as well as ephemeral streams and draws exist in the study area, and may be prone to flash flooding after heavy rain storms. Perennial aquatic environments may support species of smartweeds and docks (*Polygonaceae*), pennyworts (*Hydrocotyle* spp.), widgeon-grass (*Ruppia* spp.), pondweed (*Potamogetonaceae*), and duckweeds (*Lemna* spp.). Emergent wetlands may be located along the edges of ponds and streams during wetter periods and may be comprised of such species as rushes (*Juncus* spp.), spikerushes (*Eleocharis* spp.), sedges (*Carex* spp.), and flatsedges (*Cyperus* spp.) (Chadde 2012a and 2012b). Bottomland/riparian areas were mapped by POWER personnel through aerial photography and topographic map interpretation.

The intermittent flowing streams support aquatic species primarily adapted to ephemeral pool habitats. Because they consist of small headwater drainages, persistent flow is unlikely to be sufficient to support any substantial lotic assemblage. Aquatic species in this habitat are typically adapted to rapid dispersal and completion of life cycles in pool habitats having fine-grained substrates. In streams dominated by scoured, sandy-clay bottoms, accumulations of woody debris or leaf pack provide the most important feeding and refuge areas for invertebrates and forage fish. The softer muddy bottoms generally harbor substantial populations of burrowing invertebrates (e.g., larval diptera and oligochaetes) which can be an important food source to higher trophic levels (Hubbs 1957).

The perennial streams and lakes offer relatively stable water levels and the constant pools and flow facilitate stable population growth. Species with flowing water or pooled area habitat requirements will use the perennial streams and those adapted for deeper waters will use the lake/pond environments. With distance downstream, especially in pooled areas, the fish community tends to be heavily dominated by widely distributed sunfish (*Lepomis* spp.), bass (*Micropterus* spp.), and catfish (*Ictalurus* spp.) when sufficient water is present (Hubbs 1957). Several species of turtles, snakes, and amphibians are also

dependent on perennial surface waters for their habitat requirements. Several of these species will infrequently use terrestrial habitats to migrate from between surface waters, but they primarily use impounded and perennial surface waters.

Ponds located in the study area exhibit variability in terms of their age, drainage, use by livestock, past fish stocking, and fertilization history. These aquatic habitats are almost always exposed to full sunlight and do not typically experience the variations in flow as do streams and rivers after heavy rainfall events. Typically, fluctuations in water level are experienced during the summer months because of high evaporation rates and repeated heavy rainfall required to fill the ponds completely. Periods of extended drought in the region may reduce these seasonal water level fluctuations or dry the pond completely. Bottom materials in these ponds are typically universally silt-sized particles, either naturally occurring or added as a liner to prevent leakage.

2.2.5.4 Threatened and Endangered Species

For this routing study, emphasis was placed on obtaining documented occurrences of special status species and/or their potential habitat within the study area. The documented occurrences of species of concern and/or other unique vegetative communities within the study area were also reviewed. Special status species include those listed by the USFWS (2018b) as threatened, endangered, proposed, or candidate; and those species listed by TPWD (2018c) as threatened or endangered or rare. POWER requested a GIS data layer of historical known occurrences for listed species and/or sensitive vegetative communities from the TXNDD (TXNDD 2018). For the purpose of this study, the TXNDD information is not used as a substitute for a presence/absence survey, but as an indication of previous occurrences within suitable habitat for the species.

A USFWS (2018b) IPaC (Consultation Code: 02ETAU00-2018-SLI-1395) official species list was requested and received on August 16, 2018. This USFWS report identifies potentially occurring federal-listed threatened, endangered, and candidate species and habitats within the study area (USFWS 2018b). By definition under the ESA, a threatened species is likely to become endangered within the near foreseeable future throughout all or a significant portion of its range. An endangered species is in danger of extinction throughout all or a significant portion of its range. Candidate species are those that have sufficient information on their biological vulnerability and threat(s) to support listing as threatened or endangered and are likely to be proposed for listing in the near foreseeable future. The ESA also provides for the conservation of designated "Critical Habitat," which is defined as the areas of land, water, and air space that an endangered species needs for survival. These areas include sites with food and water,

breeding areas, cover or shelter sites, and sufficient habitat to provide for normal population growth and behavior for the species (USFWS 2017). Review of the USFWS data identified six designated Critical Habitats within the study area (USFWS 2018b). Critical Habitat for the diamond tryonia (*Pseudotryonia adamantina*), Gonzales tryonia (*Tryonia circumstriata*), Leon Springs pupfish (*Cyprinodon bovinus*), Pecos sunflower (*Helianthus paradoxus*), Pecos amphipod (*Gammarus pecos*), and Pecos assiminea snail (*Assiminea pecos*). All of these Critical Habitats are located along Leon Creek and Diamond Y Spring within the Diamond Y Spring Macrosite Conservation Easement, north of the City of Fort Stockton, and were mapped using GIS and avoided during the routing process.

Threatened and Endangered Plant Species

The USFWS (2018b) IPaC species list for the study area and TPWD (2018c) county listings were reviewed for special status plant species potentially occurring within the study area. USFWS (2018b) and TPWD (2018c) data identified two federally listed plant species within the study area, the Lloyd's mariposa cactus (*Echinomastus mariposensis*) and Pecos sunflower (*Helianthus paradoxus*).

The Lloyd's mariposa cactus is a federally listed threatened species and may be found on gravelly or rocky limestone grades of arid Chihuahuan shrublands. This species flowers in February or March and fruits one or two months after. It is typically found in the Big Bend region of Brewster and Presidio counties, although USFWS also has the species listed for Pecos County (Poole et al. 2007). This species may occur within the study area if suitable habitat is present.

The Pecos sunflower is a federally listed endangered species that is typically restricted to saline soils of permanently wet desert marshes. This species is only found in Pecos and Reeves counties as well as in five counties in New Mexico and flowers from August to November (Poole et al. 2007; TPWD 2018b). Designated Critical Habitat for this species, if found within the study area, was previously identified along Leon Creek. TXNDD (2018) data identified six occurrences of this species within moist habitats in the study area. This species may occur within the study area where suitable habitat is found.

Threatened and Endangered Animal Species

The USFWS (2018b) IPaC species list identifies eleven animal species (five birds, two fish, one crustacean, and three snails) as federally threatened or endangered for the study area. The TPWD's (2018c) Annotated County Lists of Rare Species identifies 22 federally and/or state-listed, threatened, endangered, candidate, and potentially extirpated animal species (Table 2-7). The TPWD county listing typically includes the same species that USFWS lists; however, it may also reflect additional federally

listed species. Although only federally listed threatened or endangered species are protected under the ESA, state-listed species may receive protection under other federal and/or State laws, such as the MBTA, BGEPA, Chapters 67, 68, and 88 of the TPWD Code, and sections 65.171–65.184 and 69.01–69.14 of Title 31 of the TAC. A brief species description life history and habitat requirements are summarized below for each listed species.

TABLE 2-7 LISTED THREATENED AND ENDANGERED ANIMAL SPECIES WITHIN THE STUDY AREA

LISTED SPECIES		LEGAL STATUS	
		USFWS	TPWD ²
Scientific Name	Common Name		
Birds			
<i>Buteo albonotatus</i>	Zone-tailed hawk	-	T
<i>Calidris canutus rufa</i>	Red knot	T ¹	-
<i>Charadrius melodus</i>	Piping plover	T ¹	T
<i>Coccyzus americanus occidentalis</i>	Western yellow-billed cuckoo	T ²	-
<i>Egretta rufescens</i>	Reddish egret	-	T
<i>Falco femoralis septentrionalis</i>	Northern aplomado falcon	E ¹	E
<i>Falco peregrinus</i>	Peregrine falcon	DL ²	T
<i>Sternula antillarum athalassos</i>	Interior least tern	E ¹	E
<i>Strix occidentalis lucida</i>	Mexican spotted owl	T ¹	T
<i>Vireo atricapilla</i>	Black-capped vireo	DL ²	E
Crustaceans			
<i>Gammarus pecos</i>	Pecos amphipod	E ¹	E
Fishes			
<i>Cyprinella proserpina</i>	Proserpine shiner	-	T
<i>Cyprinodon bovinus</i>	Leon Springs pupfish	E ¹	E
<i>Cyprinodon elegans</i>	Comanche Springs pupfish	E ²	E
<i>Cyprinodon pecosensis</i>	Pecos pupfish	-	T
<i>Gambusia nobilis</i>	Pecos gambusia	E ¹	E
Mammals			
<i>Canis lupus</i>	Gray wolf	EXT, E ²	E
<i>Mustela nigripes</i>	Black-footed ferret	EXT, E ²	-
<i>Ursus americanus</i>	Black bear	DL	T
Mollusks/Snails			
<i>Assiminea pecos</i>	Pecos assiminea snail	E ¹	E
<i>Popenaias popeii</i>	Texas hornshell	C ²	T
<i>Pseudotryonia adamantina</i>	Diamond tryonia	E ¹	E
<i>Tryonia circumstriata</i>	Gonzales tryonia	E ¹	E
Reptiles			
<i>Phrynosoma cornutum</i>	Texas horned lizard	-	T
<i>Tantilla cucullata</i>	Trans-Pecos black-headed snake	-	T

¹ USFWS 2018b

² TPWD 2018c.

E - Federal and/or State-Listed Endangered

T - Federal and/or State-Listed Threatened

DL - Federally Delisted

C - Federal Candidate for Listing

EXT - Extirpated from study area

Federally Listed Species

BIRDS

Interior least tern

The interior least tern (*Sternula antillarum athalassos*) is a subspecies that nests inland along sand and gravel bars within braided streams and rivers. It is also known to nest on man-made structures (inland beaches, wastewater treatment plants, gravel quarries, etc.). USFWS recognizes any nesting least tern that is 50 miles or greater from a coastline as being an interior least tern. Historically in Texas, birds nested along the Canadian, Red, and Rio Grande River systems. This species may still nest along these systems, but is typically restricted to less altered or disturbed areas. TXNDD (2018) did not identify any occurrences of this species within the study area. This species is not anticipated to occur within the study area due to a lack of suitable riparian nesting habitat, except as a rare non-breeding migrant (Lockwood and Freeman 2014).

Mexican Spotted Owl

The Mexican spotted owl (*Strix occidentalis lucida*) may occur in the Guadalupe and Davis Mountains of far west Texas, nesting on cliffs in Texas that are at higher elevations in deep, cool canyons. Unlike most other species of owls, these owls have dark colored eyes. Their habitat is characterized as mature, old-growth forests of pine (*Pinus* sp.) and fir (*Abies* sp.), on steep slopes and canyons with rocky cliffs. TXNDD (2018) did not identify any occurrences of this species within the study area. This species is not anticipated to occur within the study area due to a lack of suitable habitat. (Lockwood and Freeman 2014).

Northern aplomado falcon

The northern aplomado falcon (*Falco femoralis septentrionalis*) may be common within its range in Mexico and within South Texas. Historically, the northern aplomado falcon was found in the Trans-Pecos Region east to Midland and also in the south Texas Brushlands. This species was extirpated from Texas in the 1950s and reintroduction of the species to the region has been ongoing since 1989. Current populations exist in coastal prairies and barrier island areas of south Texas (Lockwood and Freeman 2014). In the Trans-Pecos Region, reintroduction efforts have not been as successful, and this species is a rare sighting. TXNDD (2018) did not identify any occurrences of this species within the study area. This species is not anticipated to occur within the study area except as a rare to casual visitor on mid-elevation grasslands (Lockwood and Freeman 2014).

Piping plover

The piping plover (*Charadrius melodus*) is an uncommon-to-locally common winter resident along the Texas coastline and rarely seen inland during migration. They occupy sandy beaches and lakeshores, bayside mudflats, and salt flats. Plovers feed on small marine insects and other small invertebrates. Loss and alteration of nesting and wintering habitat are the primary cause of the decline in plover populations (TPWD 2018c). TXNDD (2018) did not identify any occurrences of this species within the study area. This species is not anticipated to occur within the study area, except as a rare non-breeding migrant (Lockwood and Freeman 2014).

Red knot

The red knot (*Calidris canutus rufa*) is a migratory bird that nests in the drier arctic tundra areas and overwinters along shorelines along the Gulf of Mexico coastline and into Central and South America (TPWD 2018c; USFWS 2013). TXNDD (2018) did not identify any occurrences of this species within the study area. This species is not anticipated to occur within the study area, except as a rare non-breeding migrant (Lockwood and Freeman 2014).

Western yellow-billed cuckoo

The western yellow-billed cuckoo (*Coccyzus americanus occidentalis*) is a Neotropical migrant which typically breeds along riparian areas in far west Texas. The USFWS separates this western sub-species from its eastern counterpart by the Rocky Mountain Continental Divide for conservation purposes (National Park Service [NPS] 2014). TXNDD (2018) did not identify any occurrences of this species within the study area. This species is not anticipated to occur within the study area due to a lack of suitable habitat.

CRUSTACEANS

Pecos amphipod

The Pecos amphipod (*Gammarus pecos*) is a small species of aquatic amphipod endemic to two locations in Pecos County, Texas. This species is only known to occur at Diamond Y Spring and Leon Creek, north of the City of Fort Stockton. USFWS Critical Habitat has been designated at these locations (USFWS 2018b; TPWD 2018c). These habitats were mapped using GIS and avoided during the routing process. This species may occur within the study area along Diamond Y Springs and Leon Creek where suitable habitat is found.

FISHES

Comanche Springs pupfish

The Comanche Springs pupfish (*Cyprinodon elegans*) is a small species of fish endemic only in spring-fed waters near the City of Balmorhea, Texas. USFWS Critical Habitat has been designated at these locations (USFWS 2018b; TPWD 2018c). This species is not anticipated to occur within the study area due to a lack of suitable habitat.

Leon Springs pupfish

The Leon Springs pupfish (*Cyprinodon bovinus*) is a small species of fish endemic to natural spring-fed slow-flowing water, marshes, and pools in Pecos County. This species is only known to occur at Diamond Y Spring and Leon Creek, north of the City of Fort Stockton. TXNDD (2018) data identified three occurrences of this species at this location. USFWS Critical Habitat has been designated at these locations (USFWS 2018b; TPWD 2018c). These habitats were mapped using GIS and avoided during the routing process. This species is typically found on the margins of spring-fed marsh pools, away from vegetation. This species may occur within the study area along Diamond Y Springs and Leon Creek where suitable habitat is found.

Pecos gambusia

The Pecos gambusia (*Gambusia nobilis*) is a small species of fish endemic to spring-fed pools and marshes with constant temperature in west Texas and southeast New Mexico. In Texas, this species is found in Jeff Davis and Pecos counties, with the only known locations in aquatic habitats near the City of Balmorhea, Texas and within Leon Creek and Diamond Y Spring outflow north of the City of Fort Stockton. TXNDD (2018) data identified an occurrence of this species at this location. These habitats were mapped using GIS and avoided during the routing process. This species may occur within the study area along Diamond Y Springs and Leon Creek where suitable habitat is found.

MOLLUSKS/SNAILS

Diamond tryonia

The Diamond tryonia (*Tryonia adamantina*) is a small species of aquatic mollusk endemic to Pecos County. This species is only known to occur at Diamond Y Spring and Leon Creek, north of the City of Fort Stockton. TXNDD (2018) data identified an occurrence of this species at this location. USFWS Critical Habitat has been designated at these locations (USFWS 2018b; TPWD 2018c). These habitats were mapped using GIS and avoided during the routing process. This species occurs in mud substrates on the margins of springs and in flowing water of marshes associated with sedges and cattails. This species

may occur within the study area along Diamond Y Springs and Leon Creek where suitable habitat is found.

Gonzales tryonia

The Gonzales tryonia (*Tryonia circumstriata*) is a small species of aquatic mollusk endemic to Pecos County. This species is only known to occur at Diamond Y Spring and Leon Creek, north of the City of Fort Stockton. TXNDD (2018) data identified an occurrence of this species at this location. USFWS Critical Habitat has been designated at these locations (USFWS 2018b; TPWD 2018c). These habitats were mapped using GIS and avoided during the routing process. This species occurs in mud substrates on the margins of springs and in flowing water of marshes associated with sedges and cattails. This species may occur within the study area along Diamond Y Springs and Leon Creek where suitable habitat is found.

Pecos assiminea snail

The Pecos assiminea snail (*Assiminea pecos*) is a small species of semi-aquatic snail endemic to the Pecos River Valley of New Mexico and Texas. This species is now known only to occur at Diamond Y Spring and Leon Creek, north of the City of Fort Stockton. TXNDD (2018) data identified an occurrence of this species at this location. USFWS Critical Habitat has been designated at these locations (USFWS 2018b; TPWD 2018c). These habitats were mapped using GIS and avoided during the routing process. This species is typically found on moist ground or beneath emergent vegetation near slow moving water. This species may occur within the study area along Diamond Y Springs and Leon Creek where suitable habitat is found.

Federal Candidate Species

Texas hornshell

The Texas hornshell (*Popenaias popei*) is a freshwater mussel that inhabits both ends of narrow shallow runs over bedrock, in areas where small-grained materials collect in crevices, along river banks, and at the base of boulders; and is not known from impoundments (Howells et al. 1996). TXNDD (2018) did not identify any occurrences of this species within the study area. This species may occur within the study area if suitable habitat exists.

State Listed Species

BIRDS

Reddish egret

The reddish egret (*Egretta rufescens*) is a wading bird with blue legs, a pink bill, and might occur as white (white phase) or gray with a reddish or rusty colored head and neck (dark phase) (TPWD 2018c). The reddish egret is a permanent resident of the Texas Gulf Coast and inhabits brackish marshes and shallow salt ponds and tidal flats (Alsop 2002). This species may also occur on larger reservoirs within the Tran-Pecos region (Lockwood and Freeman 2014). This species nests on the ground or in trees or bushes, on dry coastal islands in brushy thickets of yucca and prickly pear (TPWD 2018c). TXNDD (2018) data did not identify any occurrences of this species within the study area. This species is not anticipated to occur within the study area due to a lack of suitable habitat.

Zone-tailed hawk

The zone-tailed hawk (*Buteo albonotatus*) inhabits arid open country, including open deciduous or pine-oak woodland, mesa or mountain country, often near watercourses, and wooded canyons and tree-lined rivers along middle-slopes of desert mountains. This species nests in various habitats and sites, ranging from small trees in lower desert, giant cottonwoods in riparian areas, to mature conifers in high mountain regions (TPWD 2018c). Zone-tailed hawks are uncommon to locally common summer residents to the central Trans-Pecos and east to the southern Edwards Plateau (Lockwood and Freedman 2014). This species may occur within the study area if suitable habitat is available.

FISHES

Pecos pupfish

The Pecos pupfish (*Cyprinodon pecosensis*) is a small species of fish endemic to the Pecos River Basin, now restricted to upper portions of the basin. This species is typically found in the shallows of clear, vegetated spring waters and sinkhole habitats (TPWD 2018c). TXNDD (2018) data identified two occurrences of this species along the Pecos River, near the northwest corner of the study area. This species may occur within the study area if suitable habitat is available.

Proserpine shiner

The Proserpine shiner (*Cyprinella proserpina*) is a small species of fish endemic to the Rio Grande and Pecos River Basins. This species is typically found in rocky flowing waters and pools of streams and rivers (TPWD 2018c). This species may occur within the study area if suitable habitat is available.

REPTILES

Texas horned lizard

The Texas horned lizard (*Phrynosoma cornutum*) population has decreased due to collection, land use conversions, habitat loss, and increased fire ant populations. The Texas horned lizard inhabits a variety of habitats including open desert, grasslands, and shrubland in arid and semiarid habitats that contain bunch grasses, cacti, and yucca on soils varying from pure sands and sandy loams to coarse gravels, conglomerates, and desert pavements. Their primary prey item is the harvester ant (*Pogonomyrmex* spp.), but they may also consume grasshoppers, beetles, and grubs. The Texas horned lizard thermo-regulates by basking or burrowing into the soil and is active (not hibernating) between early spring to late summer (Henke and Fair 1998). This species may occur within the study area where suitable habitat is available.

Trans-Pecos black-headed snake

The Trans-Pecos black-headed snake (*Tantilla cucullata*) habitat may occur on steep and rocky substrates in mesquite-creosote or pinyon-juniper-oak habitats of west Texas. This species is mostly nocturnal and lays its eggs between June and August. TXNDD (2018) data identified an occurrence of this species in the eastern half of the study area. This species may occur within the study area where suitable habitat is available.

Federally Delisted Species

Peregrine Falcon

The peregrine falcon (*Falco peregrinus*) state listing includes two subspecies: American peregrine falcon (*F. p. anatum*) and arctic peregrine falcon (*F. p. tundrius*). Although only the American subspecies is listed as state threatened, both sub-species are listed together because of their similarity of appearance (TPWD 2018c). Both subspecies are federally delisted because of the recovery of population numbers. The American peregrine falcon inhabits nests in tall cliff eyries and occupies many kinds of habitats during migration, including urban. Stopover habitat during migration may include lake shores and coastlines and the falcon is also a resident breeder in west Texas (USFWS 2006; TPWD 2018c). This species is not anticipated to occur in the study area except as a rare migrant (Lockwood and Freeman 2014).

Black bear

The American black bear (*Ursus americanus*) was listed due to similarities to the sub-species of Louisiana black bear (*U. a. luteolus*). However, as of March 10, 2016, Louisiana black bear was delisted from the Endangered Species List due to recovery of the population. The Louisiana black bear is only known to occur within portions of Louisiana, Mississippi and east Texas and preferred habitat in

bottomland hardwoods and large tracts of inaccessible forested areas (TPWD 2018c). The American black bear historically inhabited various habitats throughout Texas and was once thought to be extirpated from the state. In recent years sightings have increased near the Chisos Mountains in west Texas and the Texas Panhandle from bears dispersing from rugged terrain in Mexico and New Mexico (Schmidly and Bradley 2016). This species may occur within the study area where suitable habitat is found.

Black-capped vireo

The black-capped vireo (*Vireo atricapilla*) nests from northern Tamaulipas through west and central Texas and isolated portions of Oklahoma (Graber 1961; Campbell 2003). Suitable nesting areas typically consist of a patchy network of dense low shrubland cover with branches extending to the ground. Shrub sized broad-leaved vegetation will in general cover 30 to 60 percent or greater of the area and be approximately six feet tall or more (Campbell 2003). Habitat vegetation is typically within early succession stages or located on shallow, poor, or eroded soils which encourage the growth of patchy low shrublands (Graber 1961). The vireo nests from March to July with the young fledging in three to four weeks (Graber 1961; Campbell 2003). It is not uncommon for these vireos to have multiple nesting attempts within one breeding season, building a new nest with each nesting attempt (Graber 1961). Review of TXNDD (2018) data did not identify any occurrences of this species within the study area. This species may occur within the study area as a breeding spring/summer resident (Lockwood and Freeman 2014) if suitable habitat is available.

Extirpated Listed Species

Gray wolf

The gray wolf (*Canis lupus*) was formerly known throughout the western two-thirds of the state inhabiting forests, brushlands, and grasslands. However, the species is now considered extirpated from the state of Texas (Schmidly and Bradley 2016). This species is not anticipated to occur within the study area.

Black-footed ferret

The federally-listed endangered black-footed ferret (*Mustela nigripes*) is associated primarily with prairie dog towns and historically ranged in Texas throughout the northwestern portion of the state including the Panhandle, much of the Trans-Pecos, and a considerable part of the Rolling Plains. However, the black footed ferret is now considered extirpated from Texas with the last records from Dallam County in 1953 and Bailey County in 1963 (Schmidly and Bradley 2016). Therefore, the occurrence of the black-footed ferret within the study area is not anticipated.

Rare Species and Sensitive Vegetation Communities

While not regulated, TPWD (2018c) and TXNDD (2018) data also list rare species and sensitive vegetation communities. TPWD generally recommends consideration for these species and avoidance of the listed vegetation communities when routing linear utility corridors. However, these data do not preclude the potential for each species to exist within the study area. Only a species-specific survey could delineate potential suitable habitat and determine the presence or absence of a special status species. Review of the TXNDD (2018) data identified several species of concern and sensitive vegetation communities within the study area. These habitats were mapped using GIS and taken into account during the routing process. For a discussion of TPWD listed rare species, please refer to the TPWD letter in Appendix A.

2.3 Community Values

The term “community values” is included as a factor for the consideration of transmission line route certification under § 37.056(c)(4)(A) of the Texas Utilities Code. The PUC CCN application requires information concerning the following items that may reveal community values:

- Public meeting or public open house.
- Approvals or permits required from other governmental agencies.
- Brief description of the area traversed.
- Habitable structures within 500 feet of the centerline of the proposed project.
- FAA registered airports, private airstrips, and heliports located in the area.
- Irrigated pasture or croplands utilizing center-pivot or other traveling irrigation systems.

In addition, POWER evaluated the Proposed Project for community values that might not be specifically listed by the PUC in a rule or the application form, but that might be of importance to the community in the area of the project. The term “community values” is not formally defined in the PUC rules. However, in several dockets the PUC Staff and PUC Commissioners have used the following as a working definition: the term “community values” is defined as *a shared appreciation of an area or other natural resource by a national, regional, or local community*. Examples of a community resource would be a park or recreational area, historical or archeological site, or a scenic vista (aesthetics). POWER and LCRA TSC/AEP Texas mailed consultation letters to various local elected and appointed officials and hosted a public open house meeting to identify and collect information regarding community values and community resources.

2.4 Human Development

The study area is comprised of numerous political jurisdictions and land uses. Land use data was collected from a variety of federal, state, and local sources and was organized into the following categories:

- Existing Land Use (Urban/Developed)
- Planned Land Use
- Agricultural
- Oil and Gas Facilities
- Utility Features/Generation Facilities
- Transportation/Aviation/Communication Facilities
- Parks and Recreation Areas

2.4.1 Existing Land Use

Existing land uses were placed into the following categories: urban/developed, agriculture, industrial, and transportation features. The primary sources of land use information were obtained from interpretation of aerial photographs, USGS topographical maps, input from the public and local representatives of the public, and reconnaissance surveys.

Habitable Structures

The PUC definition of a habitable structure was used for this routing study. 16 TAC § 25.101(a)(3) defines a habitable structure as “structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis. Habitable structures include, but are not limited to, single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, business structures, churches, hospitals, nursing homes, and schools.” Habitable structures were identified using aerial photograph interpretation and reconnaissance surveys from public access roads. Locations of the habitable structures are depicted on Figures 4-1a, b, and c, and the distance from each route centerline is presented in Tables 4-3 through 4-27.

Urban/Developed

The urban/developed classification represents concentrations of surface-disturbing land uses, which include habitable structures and other developed areas characterized with low, medium, and high intensities. The various levels of development include a mix of residential, commercial, and/or industrial land uses.

Developed low, medium, and high intensity areas were identified using aerial photograph interpretation and reconnaissance surveys. These classifications are described below:

- **Developed Low Intensity** areas typically include rural settings with single-family housing units.
- **Developed Medium Intensity** areas typically include single-family housing units that are grouped in residential subdivisions and may include peripheral commercial structures.
- **Developed High Intensity** includes highly developed areas where people reside or work in high numbers. Examples include apartment complexes, row houses, and commercial/industrial parks. Areas with the highest concentration of development are typically located within or near the towns and communities in the study area.

Schools

The study area is located within the following three school districts: Buena Vista Independent School District (ISD), Fort Stockton ISD, and Iraan-Sheffield ISD. Fort Stockton ISD has five existing schools located within the study area. Buena Vista and Iraan-Sheffield ISDs have no existing schools located within the study area (TEA 2018).

2.4.2. Planned Land Use

The planned land use component identifies objectives and/or policies regarding land use goals and plans, including conservation easements, managed lands, and proposed developments. Cities and counties typically prepare comprehensive land use plans to provide strategic direction by goals and objectives for the individual city or county. City and county websites were reviewed and correspondence was submitted to local and county officials to identify potential planned land use conflicts. The City of Fort Stockton does not have a comprehensive land use plan, nor do any of the other communities located within the study area.

Conservation Easements

A conservation easement is a restriction property owners voluntarily place on specified uses of their property to protect natural, productive or cultural features. The property owner retains legal title to the property and determines the types of uses to allow or restrict. The property can still be bought, sold and inherited, but the conservation easement is tied to the land and binds all present and future owners to its terms and restrictions. Conservation easement language will vary as to the individual property owner's allowances for additional developments on the land.

A review of non-governmental groups (e.g., National Conservation Easement Database [NCED], The Nature Conservancy [TNC], and Texas Land Conservancy [TLC]) that are land trusts and hold a database for conservation easements within Texas indicated that there are four conservation easements within the study area (NCED 2018; TNC 2018; TLC 2018). All four easements are listed under the name Diamond Y Spring Macrosite Easement and are located north of Fort Stockton. They are privately held by the TNC and are approximately 143 acres, 2,588 acres, 1,411 acres, and 100 acres each (TNC 2018). The land trusts facilitate the conservation easement and ensure compliance with the specified terms and conditions.

2.4.3 Agriculture

Agriculture is a significant segment of the economy throughout Texas, and Pecos County has active agricultural sectors. According to the USDA National Agricultural Statistics Service's 2012 Census of Agriculture, the total market value for agricultural products sold for Pecos County was \$47,470,000, an increase of 72 percent over the 2007 market value of \$27,545,000. Crop sales accounted for the majority of agricultural sales in Pecos County. The number of farms in Pecos County increased slightly from 287 in 2007 to 291 in 2012 (an increase of one percent) (USDA 2012).

2.4.4 Oil and Gas Facilities

Data was obtained from the RRC (RRC 2018b), which provided a GIS layer for existing oil and gas wells, pipelines, and supporting facilities. Data point categories were reviewed and included the following types: permitted locations, oil, gas, injection/disposal, shut-in, horizontal drain hole, and sidetrack well surface locations. The 2018 RRC dataset along with aerial photograph interpretation and field reconnaissance were used to identify and map existing oil and gas related facilities. Oil and gas wells were identified and are scattered throughout the study area, with greater density in the northern half of the study area.

2.4.5 Utility Features/Generation Facilities

Based on 16 TAC § 25.101(b)(3)(B), paralleling or utilizing existing compatible ROWs and other features are areas that should be considered as areas of opportunity when selecting route alternatives for new transmission lines. Existing compatible ROWs include electrical transmission lines, distribution lines, railroads, and roadways. Other features include property lines or other natural or cultural features. Existing transmission lines, several roadways, parcel lines, and apparent property boundaries were considered as potential paralleling opportunities. Data sources used to identify existing electrical transmission lines include utility company and regional system maps, PLATTS data (2018), aerial imagery, USGS topographical maps, additional available planning documents, and field reconnaissance.

Transmission lines identified include one 345-kV transmission line, nine 138-kV transmission lines, and seven 69-kV transmission lines within the study area. Distribution lines are prevalent throughout the developed portions of the study area; however, these features were not mapped or inventoried.

In addition, several pipelines, with a diameter of 6 inches and above, and water wells were identified and are scattered throughout the study area (Penwell 2018; RRC 2018b; TWDB 2018; University Land Wells 2017).

Generation facilities included four existing wind farms and three existing solar farms identified within the study area boundary.

2.4.6 Transportation/ Aviation/ Communication Facilities

Transportation Facilities

Federal, state, and local roadways were identified using TxDOT county transportation maps, TNIRIS data, and field reconnaissance surveys. The roadway transportation system within the study area includes IH10, US Hwy 67, US Hwy 285, US Hwy 385, SH 18, and SH 194, as major roadways. The roadway transportation within the study area also includes the following FM roads: 11, 1053, 1776, 1901, 2023, and 2037. Numerous county and local roads (paved and unpaved) were also identified.

TxDOT's "Project Tracker," which contains detailed information by county for every road/highway project which is or could be scheduled for construction, was reviewed to identify any state roadway projects planned within the study area. The TxDOT Project Tracker indicates that there are eight roadway improvement projects and one roadway widening project located within the study area. The projects include adding milled edge line rumble strips, seal coat, and safety treat fixed objects to the roadways. The roadway widening project is along the southwestern portion of US Hwy 67 but is not scheduled to receive bids until April 2021 (TxDOT 2018a).

The railroads identified within the study area include one South Orient Railroad and one abandoned railroad. Both railroads are located in the central portion of the study area.

Aviation Facilities

POWER reviewed the El Paso and San Antonio Sectional Aeronautical Charts (FAA 2017a and 2017b) and the Chart Supplement for the South Central US (formerly the Airport/Facility Directory) (FAA 2018b) to identify FAA registered facilities within the study area subject to notification requirements

listed in 14 CFR Part 77.9. Facilities subject to notification requirements listed in 14 CFR Part 77.9 include public-use airports listed in the Airport/Facility Directory (currently the Chart Supplement), public-use or military airports under construction, airports operated by a federal agency or DoD, or an airport or heliport with at least one FAA-approved instrument approach procedure.

The Chart Supplement for the South Central US used in conjunction with the El Paso and San Antonio Sectional Aeronautical Charts, contains all public-use airports, seaplane bases and public-use heliports, military facilities, and selected private-use facilities specifically requested by the DoD for which a DoD Instrument Approach Procedure has been published in the US Terminal Procedures Publication.

One public-use FAA registered airport was identified within the study area (FAA 2018b). The Fort Stockton-Pecos County Airport is located within the central portion of the study area and has a runway approximately 4,400 feet long. No public-use heliports or heliports with an instrument approach procedure are listed for the study area in the Chart Supplement for the South Central US (FAA 2018b).

The Fort Stockton very high frequency (VHF) Omnidirectional Range / Tactical Aid to Navigation (VORTAC) ground-based air navigation aid was identified within the study area. This is a radio navigation system that broadcasts a navigational signal and transmits continuously in the VHF and ultra-high frequency (UHF) range (FAA 1986).

In addition, POWER also reviewed the FAA database (FAA 2018a), USGS topographic maps, recent aerial photography, and conducted field reconnaissance from publicly accessible areas to identify private-use airstrips and private-use heliports not subject to notification requirements listed in 14 CFR Part 77.9. There were five private-use airstrips and one private-use heliport identified within the study area. Locations of the airports, airstrips, and heliports can be found on Figures 3-14a, b, c and 4-1a, b, c, and the distances from each route centerline is presented in Tables 4-3 through 4-27.

Communication Towers

Review of the Federal Communication Commission (FCC) database indicated that there is one amplitude modulation radio (AM radio) transmitter located just south of the City of Fort Stockton in the central portion of the study area (FCC 2014).

The FCC also indicated that there are 37 verified frequency modulation radio (FM radio) transmitters/microwave towers/other electronic installations located within the study area (FCC 2014). These towers

are scattered throughout the study area. Locations of the identified communication towers can be found on Figures 3-14a, b, c and 4-1a, b, c, and the distances from each route centerline is presented in Tables 4-3 through 4-27.

2.4.7 Parks and Recreation Areas

The PUC Standard Application for a CCN requires reporting of parks and recreational areas owned by a governmental body or an organized group, club, or church. Federal and state databases and county/local maps were reviewed to identify any parks and/or recreational areas within the study area. Field reconnaissance surveys were also conducted to identify any additional park or recreational areas.

National/State/County/Local Parks – No national, state, or county parks were identified within the study area (NPS 2018a) (TPWD 2018d).

Local park and recreation areas identified within the study area include:

- Alamo Elementary is located on US Hwy 385 and offers two playscapes and swing sets.
- Apache Elementary is located on West 18th Street and offers basketball courts, tether ball, playscape, and swing sets.
- Desert Pines Golf Course is located on US Hwy 285 and offers an 18-hole course.
- Fort Stockton City Park is located on West 14th Street and offers covered picnic tables, playscape, swing set, merry go round, and space ship climbing structure.
- Fort Stockton High School is located on West 17th Street and offers a football stadium, track, baseball field, and tennis courts.
- Fort Stockton Intermediate School is located on West 2nd Street and offers basketball courts, tennis courts, tack, and swing sets.
- Fort Stockton Middle School is located on West 5th Street and offers a football field, tack, and tennis courts.
- Fort Stockton Recreation Center is located on US Hwy 385 and offers a meeting hall, kitchen, and restrooms.
- Fourteen Mile Park is located on the north side of IH 10 and offers covered picnic tables, restrooms, and parking for large trucks.
- Imperial Highway Park is located on Imperial Hwy/FM 1053 and offers a covered pavilion, basketball court, sand volleyball court, swing set, slide, and playscape.

- James Rooney Memorial Park is located on Parkview Road and offers basketball court, tennis court, walking trail, two playscapes, two covered pavilions, picnic tables, swimming pool, and four baseball fields.
- James Street Park is located on West James Street and offers covered picnic tables and two playground areas.
- Jaycee Park is located on West 3rd Street and offers picnic tables, benches, playscape, and swing set.
- Lannom Park is located on West 7th Street and offers picnic tables, benches, playscape, and swing set.
- Manuel R. Nunez Park is located on South Main Street and offers a gazebo, covered pavilion, rest rooms, benches, and basketball court.
- Pat Taylor Athletic Field is located on South Rio Street and offers four baseball fields.
- Railroad Avenue Park is located on West Railroad Avenue and offers sand volleyball courts, playground, and splash pad.
- Road Side Park is located on the south side of US Hwy 67 and offers covered picnic tables and parking for large trucks.
- TxDOT Pecos County Road Side Park is located on both sides of IH 10 and offers covered picnic tables, restrooms, and parking areas for large trucks.
- Zero Stone Park and Gazebo is located on South Main Street and offers a gazebo, picnic tables, benches, and memorials.

Wildlife Viewing Trails

Review of the TPWD Great Texas Wildlife Trails Far West Texas Trail indicates that there is one driving loop, Permian Basin West Loop, and one wildlife viewing site, Rooney Park and Historic Fort Native Garden, located within the City of Fort Stockton (TPWD 2018e).

Additional recreational activities such as hunting and fishing may occur on private properties throughout the study area, but are not considered to be open to the general public. Locations of the identified parks and recreation areas can be found on Figures 3-14a, b, c and 4-1a, b, c, and the distances from each route centerline is presented in Tables 4-3 through 4-27.

2.5 Socioeconomics

This section presents a summary of economic and demographic characteristics for Pecos County and describes the socioeconomic environment of the study area. Literature sources reviewed include publications of the United States Census Bureau (USCB) and the Texas State Data Center (TxSDC).

2.5.1 Population Trends

Pecos County experienced a population decrease between 2000 and 2010 of eight percent. By comparison, population at the state level increased by nearly 21 percent during the same decade (USCB 2000 and 2010).

According to TxSDC growth projections, Pecos County is projected to experience population growth during the next 30 years. The population increases for the next three decades are projected to be 10 percent, eight percent, and seven percent, respectively. By comparison, the population of Texas is expected to experience population increases of 15 percent, 13 percent, and 12 percent over the same three decades, respectively (TxSDC 2014). Table 2-8 presents the past population trends and projections for Pecos County and for the state of Texas.

TABLE 2-8 POPULATION TRENDS

STATE/COUNTY	PAST		PROJECTED		
	2000	2010	2020	2030	2040
Texas	20,851,820	25,145,561	28,813,280	32,680,231	36,550,578
Pecos County	16,809	15,507	17,051	18,450	19,702

Source: USCB 2000 and 2010; TxSDC 2014.

2.5.2 Employment

The civilian labor force (CLF) in Pecos County increased from 2010 to 2016 with the corresponding population growth by 7.0 percent (445 people). By comparison, the CLF at the state level grew by 11 percent (1,256,676 people) over the same time period (USCB 2010 and 2016).

Between 2010 and 2016, Pecos County experienced a decrease in its unemployment rate from 4.4 percent in 2010 to 4.0 percent in 2016. By comparison, the state of Texas also experienced a small decrease in the unemployment rate over the same time period. The state's unemployment rate decreased from 7.0 percent in 2010 to 6.4 percent in 2016 (USCB 2010 and 2016). Table 2-9 presents the CLF, employment, and unemployment data for Pecos County and the state of Texas for the years 2010 and 2016.

TABLE 2-9 CIVILIAN LABOR FORCE AND EMPLOYMENT

STATE/COUNTY	2010	2016
Texas		
Civilian Labor Force	11,962,847	13,219,523
Employment	11,125,616	12,371,392
Unemployment	837,231	848,131
Unemployment Rate	7.0%	6.4%
Pecos County		
Civilian Labor Force	6,052	6,497
Employment	5,787	6,238
Unemployment	265	259
Unemployment Rate	4.4%	4.0%

Source: USCB 2010 and 2016.

2.5.3 Leading Economic Sectors

The major occupations in Pecos County in 2016 are listed under the category of sales and office occupations, followed by the category of natural resources, construction, and maintenance occupations (USCB 2016). Table 2-10 presents the number of persons employed in each occupation category during 2016 in Pecos County.

TABLE 2-10 OCCUPATIONS IN PECOS COUNTY

OCCUPATION	PECOS COUNTY
Management, business, science, and arts occupations	1,225
Service occupations	1,227
Sales and office occupations	1,401
Natural resources, construction, and maintenance occupations	1,244
Production, transportation, and material moving occupations	1,141

Source: USCB 2016

In 2010, the industry group employing the most people in Pecos County was educational services, and health care and social assistance, and in 2016 it was agriculture, forestry, fishing and hunting, and mining. The industry group that experienced the most growth from 2000 to 2012 was transportation and warehousing, and utilities, which experienced a 196 percent increase (394 people) (USCB 2016). Table 2-11 presents the number of persons employed in each of the industries in Pecos County for the years 2010 and 2016.

TABLE 2-11 INDUSTRIES IN PECOS COUNTY

INDUSTRY GROUP	PECOS COUNTY	
	2010	2016
Agriculture, forestry, fishing and hunting, and mining	1,076	1,156
Construction	435	606
Manufacturing	78	105
Wholesale trade	52	82
Retail trade	707	833
Transportation and warehousing, and utilities	201	595
Information	68	11
Finance and insurance, and real estate and rental and leasing	206	216
Professional, scientific and management, and administrative and waste management services	195	244
Educational services, and health care and social assistance	1,145	1,086
Arts, entertainment, and recreation, and accommodation and food services	734	479
Other services, except public administration	238	230
Public administration	652	595

Source: USCB 2010 and 2016.

2.6 Aesthetics

§ 37.056(c)(4)(C) of the Texas Utilities Code incorporates aesthetics as a consideration when evaluating proposed electric transmission facilities. There are currently no formal guidelines provided for managing visual resources on private, state, or county owned lands. For the purposes of this study, the term aesthetics is defined by POWER to accommodate the subjective perception of natural beauty in a landscape and measure an area's scenic qualities. The visual analysis was conducted by describing the regional setting and determining a viewer's sensitivity. Related literature, aerial photograph interpretation, and reconnaissance surveys were used to describe the regional setting and to determine the landscape character types for the area.

Consideration of the visual environment includes a determination of aesthetic values (where the major potential effect of a project on the resource is considered visual) and recreational values (where the location of a transmission line could potentially affect the scenic enjoyment of the area) that would help define a viewer's sensitivity. POWER considered the following aesthetic criteria that combine to give an area its aesthetic identity:

- Topographical variation (hills, valleys, etc.).

- Prominence of water in the landscape (rivers, lakes, etc.).
- Vegetation variety (woodland, meadows).
- Diversity of scenic elements.
- Degree of human development or alteration.
- Overall uniqueness of the scenic environment compared with the larger region.

The study area is primarily rural with residential and commercial development concentrated in and around the City of Fort Stockton. The predominant land use within the study area is rangeland and pastureland. The majority of the study area has been impacted by land improvements associated with agriculture, residential/commercial structures, various utility corridors, oil and gas activities, and roadways. Overall, the study area viewscape consists of open rangeland/pastureland.

No known designated views or designated national or state scenic roads or highways were identified within the study area. The study area is located within the 22-county Texas Pecos Trail Region. The trail runs along IH 10 and there are six sites of interest identified within the study area. They include: the Annie Riggs Memorial Museum, Comanche Springs Pool, Historic Fort Stockton, Old Pecos County Jail, Rollins Sibley House, and World's Tallest Roadrunner (THC 2018a).

A review of the NPS website did not indicate any Wild and Scenic Rivers, National Monuments, National Historic Sites, National Historic Landmarks, National Historic Trails, or National Battlefields within the study area (NWSRS 2018; NPS 2018b and 2018c).

Based on these criteria, the study area exhibits a moderate degree of aesthetic quality for the region. The majority of the study area maintains the feel of a rural community. Although some portions of the study area might be visually appealing overall, the aesthetic quality of the study area is not distinguishable from that of other adjacent areas within the region.

2.7 Cultural Resources

§ 37.056(c)(4)(A-D) of the Texas Utilities Code incorporates historical values as a consideration when evaluating proposed electric transmission facilities. The PUC's Standard Application for a CCN further stipulates that known historical sites within 1,000 feet of an alternative route should be listed, mapped, and their distance from the centerline of the alternative route documented in the application filed for consideration. Archeological sites within 1,000 feet of a route should be listed and their distance from the

centerline documented, but they need not be shown on maps for the protection of the site. Sources consulted to identify known sites (national, state, or local commission) should also be listed.

The THC is the state agency responsible for preservation of the state's cultural resources. The THC, working in conjunction with the TARL, maintains records of previously recorded cultural resources as well as records of previous field investigations. Information from the THC's restricted-access Texas Archeological Sites Atlas (TASA) and Texas Historical Sites Atlas (THSA) was acquired, in addition to GIS shapefiles acquired from TARL, to identify and map locations of previously recorded cultural (archeological and historical) resources within the study area. TxDOT's historic bridges database was also reviewed for bridges that are listed or determined eligible for listing on the NRHP. At the national level, NPS websites and data centers were reviewed to identify locations and boundaries for nationally designated historic landmarks, trails and battlefield monuments.

Together, archeological and historical sites are often referred to as cultural resources. Under the NPS standardized definitions, cultural resources include districts, sites, buildings, structures, or objects important to a culture, subculture, or community for scientific, traditional, religious, or other reasons. For this study, cultural resources have been divided into three major categories: archeological resources, historical resources, and cemeteries. These three categories correlate with the organization of cultural resource records maintained by the THC and TARL.

Archeological resources are sites where human activity has measurably altered the earth and left deposits of physical remains (e.g., burned rock middens, stone tools, petroglyphs, house foundations, trails, trash scatters). Most archeological sites in Texas are Native American (prehistoric), Euro/African American, or Hispanic in origin. Much of the study area has not been studied intensively for archeological resources. Therefore, high probability areas (HPAs) for prehistoric and historic archeological resources were determined based on proximity to perennial water sources, certain topographic features, and the presence of structures on historic maps in currently undeveloped areas.

Historical resources include standing buildings or structures (e.g., houses, barns and out buildings), and may also include dams, canals, bridges, transportation routes, silos, etc., and districts that are non-archeological in nature and generally more than 50 years of age.

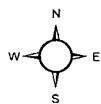
Cemeteries are locations of intentional human interment and may include large public burial grounds with multiple individuals, small family plots with only a few burials, or individual grave sites. In some

instances, cemeteries may be designated as Historic Texas Cemeteries (HTCs) by the THC or recognized with an Official Texas Historical Marker (OTHM). Cemeteries may also be documented as part of the THC Record-Investigate-Protect (RIP) Program.

2.7.1 Cultural Background

Prehistory

The study area is located in Pecos County, Texas within the Trans-Pecos Resource Planning Region, which is similar in extent to Pertulla's (2004) Trans-Pecos archeological region, and shown in Figure 2-5. More specifically, the study area is located within the eastern Trans-Pecos regions, as described by Miller and Kenmotsu (2004). Based primarily on perceived technological changes evident in the archeological record often correlated with broad changes in the physical and cultural environment, the prehistoric occupation of the eastern Trans-Pecos region is most often divided into three broad archeological periods spanning at least the last 12,000 years. These periods include the Paleoindian period, beginning around 12,000 years before present (B.P.); the long-lasting Archaic period, which comprises almost two-thirds of the known prehistoric occupation of west Texas, from about 8,000 B.P. until approximately 1,050 B.P.; and the Late Prehistoric period, which ended with the first Spanish expedition into the region in the late-1500s (approximately 450 B.P.). The following discussion of the culture history of the study area relies heavily on the cultural chronology of the eastern Trans-Pecos Region of West Texas as presented by Miller and Kenmotsu (2004).



0 25 50 100 150 200 250
Miles

Legend



-  Cultural Resource Planning Region Boundary
-  County Boundary

Figure 2-5
LOCATION OF THE STUDY AREA
IN RELATION TO THE
CULTURAL RESOURCE
PLANNING REGIONS OF TEXAS

Bakersfield-Solstice
345-kV Transmission Line Project



Source: Mercado-Allinger et al., 1996

Paleoindian Period (12,000-8,800 B.P.)

The Paleoindian period is the earliest accepted occupation of peoples in North America. During this period, small, highly mobile bands hunted now-extinct megafauna such as mammoths (*Mammuthus columbi*) and bison (*Bison antiquus*). Despite the popular misconception that these early populations were primarily hunters, evidence from the Gault Site in central Texas suggests that their diet was more generalized (Collins 2002). Archeological evidence indicates that these early hunting and gathering populations subsisted on a well-diversified resource base that included smaller animals, fish, and a variety of reptiles. Paleoindian sites in the region are very rare compared to those from later periods. In the eastern Trans-Pecos region, the early Paleoindian period is subdivided into two complexes, the Clovis Complex and the Folsom Complex, based primarily on diagnostic lanceolate projectile points (Miller and Kenmotsu 2004).

Corresponding with the waning years of the Pleistocene era, the early Paleoindian period was characterized by a comparatively cooler, wetter environment. West Texas was covered in moist woodlands with continuously flowing streams in the mountains, and lakes and marshes throughout the interior basins, and more numerous and more reliable springs and seeps than today (Miller and Kenmotsu 2004; Simmons et al. 1989). The Clovis Complex, attributed to the early Paleoindian Period, is identified by the Clovis spear points, first identified near Clovis, New Mexico (Hofman and Graham 1998). Clovis occupation in the eastern Trans-Pecos region is almost entirely recognized from isolated finds of fluted Clovis points and from private collections. Thus, Clovis adaptations for the eastern Trans-Pecos region are extrapolated from regions where more data exists (Miller and Kenmotsu 2004).

When the Pleistocene epoch came to an end around 10,900 years ago and the mammoth populations had all but disappeared, prehistoric populations began to focus their hunting efforts on the now extinct *Bison antiquus*, one of the hallmarks of the transition from the early to the late Paleoindian period (Collins 2004). There appears to have been a gradual trend toward warmer and drier conditions, with woodlands slowly replaced by open grassland savannah that supported large herds of bison. Folsom occupation in the eastern Trans-Pecos is known from a site on Chispa Creek in Van Horn County that yielded large numbers of Folsom points, channel flakes, stone tools, and debitage (Miller and Kenmotsu 2004). Folsom components are often mixed with artifacts from the Archaic period in the Trans-Pecos region, making it difficult to separate non-diagnostic artifacts in the mixed assemblages (Miller and Kenmotsu 2004).

The Late Paleoindian Period is recognized by stone tool traditions referred to as the Cody and Plano Complexes, both of which relied heavily on bison (Hofman and Graham 1998). Mesquite, Golondrina, and

Angostura projectile points are typical of the Late Paleoindian Period in the eastern Trans-Pecos region (Turpin 2004). In the eastern Trans-Pecos, Cody and Plano components are found more frequently than the early Paleoindian Complexes, and are identified primarily by Meserve, Golondrina, and Angostura projectile points (Turpin 2004). Although Late Paleoindian components are found in a wide range of topographic zones, most are found near large permanent sources of water, such as the Rio Grande valley and large playas, the last locations with suitable habitats for large animals in an increasingly warmer and dryer Holocene environment (Hofman and Graham 1998; Turpin 2004).

Environmental changes that brought about the extinction of Rancholabrean megafauna and the conversion of woodlands to desert plant communities in west Texas triggered a shift away from Paleoindian adaptations toward a broad-based subsistence orientation termed Archaic (Miller and Kenmotsu 2004; Willey and Phillips 1958).

Archaic Period (8,800-1,250 B.P.)

The Archaic period spans almost 7,000 years, the bulk of the prehistory of the Trans-Pecos region. Probably the most prominent characteristic of the Archaic period is that it epitomizes the foraging lifestyle. In the eastern Trans-Pecos, the period is subdivided into the early, middle, and late Archaic sub-periods based on changes in subsistence and technology in response to broad environmental changes. In general, during the Archaic period, increasing population and increasingly diverse subsistence systems led to an intensification of land use patterns and the exploitation of a broader range of environmental zones (Kenmotsu and Miller 2004).

Little is known of the early Archaic (circa 8,000-6,000 B.P.) in the eastern Trans-Pecos, due to sparse data and no firmly dated substantial early Archaic sites in the region (Kenmotsu and Miller 2004). During this period, the use of stone or caliche as cooking stones appears, and early Archaic materials are found in burned rock features and middens throughout the eastern Trans-Pecos. Groundstone tools appear, coincident with the use of burned rock thermal features, indicating a greater reliance on plant processing (Kenmotsu and Miller 2004). Changes in projectile points during the early Archaic also indicate a change in subsistence. Large lanceolate blades from the Paleoindian period are replaced by smaller stemmed points, such as Uvalde, Martindale, and, later, Pandale and Bulverde points, indicating a focus on smaller game such as deer (Simmons et al. 1989). Increasing regionalization of point types is apparent; point types in the eastern Trans-Pecos are similar to those found in central Texas. Increased regionalization of point types and an increased reliance on locally accessible stone raw materials

suggest early Archaic groups had a more restricted range of movement than their predecessors (Miller and Kenmotsu 2004).

There is an increase in sites dating to the middle Archaic (circa 5,000-3000 B.P.), suggesting population growth in the Trans-Pecos region during this period. Paleoclimate data shows a continual drying trend that may have caused middle Archaic groups to have a more seasonally intensive land use pattern focused on specific resources (Miller and Kenmotsu 2004). Between 4,000 and 2,500 years B.P., moisture appears to have increased, although middle Archaic subsistence systems still depended on the collection and processing of desert succulents (Simmons et al. 1989). Middle Archaic sites tend to be larger and have more features than early Archaic sites. Although middle Archaic components are found in a variety of settings, suggesting exploitation of new environmental niches, settlement is centered on streams. The most common projectile point forms dating to the middle Archaic have contracting stems with flat, rounded, or pointed bases or expanding stems and concave bases. The contracting stem variations, like Coahuila points, are more prominent in the eastern Trans-Pecos region. Patterns of tool manufacture and maintenance indicate a focus on conservation of tools and repurposing worn or broken tools (Miller and Kenmotsu 2004).

During the late Archaic (circa 3,000-1,500 B.P.), thermal features with burned rock become more numerous and larger (Miller and Kenmotsu 2004). Ring middens become more prominent, some of which have large quantities of lithic artifacts, ash, and charcoal. The sheer number of these features suggests widespread exploitation of desert succulents during the late Archaic. Thoms (2008 and 2009) posited that a marked increase in the use of hot-rock ovens is an expected signature of land-use intensification, which would be expected during a prolonged period of population growth and the onset of mesic conditions following a period of increasing moisture, such as the increase seen during the middle Archaic period. Projectile point technology modifications include shaft to corner and side-notched forms. Adaptations and strategies adopted during the Late Archaic would persist even into historic times in the eastern Trans-Pecos (Miller and Kenmotsu 2004).

Late Prehistoric Period (1,250-300 B.P.)

The Late Prehistoric period in the eastern Trans-Pecos region continued patterns in mobility, subsistence, and settlement that had developed during the Late Archaic, and sites dating to this period yield even larger quantities of materials than those from earlier periods (Miller and Kenmotsu 2004) despite being smaller in general (Simmons et al. 1989). Groups in the eastern Trans-Pecos adopted the bow and arrow and ceramics during this period. A variety of ceramics types have been recorded in the region, indicating

that although the people of the eastern Trans-Pecos interacted with neighboring agricultural groups, they continued traditional lifeways that had developed during the Archaic periods (Miller and Kenmotsu 2004). Within the study area, site 41PC14, also called Squawteat Peak, illustrates the longevity of the foraging lifestyle in the eastern Trans-Pecos. Seven occupation areas and a lithic procurement/quarry area are recorded at the State Antiquities Landmark site. Burned rock middens, multiple hearths, at least 14 tipi or wiki up rings, and bedrock mortar holes are recorded at the site (Turpin 2011; Whelan 2018). Projectile points from the site date from as early as the middle Archaic to the Late Prehistoric periods, and the largest burned rock midden was used as recently as 650 B.P. (Whelan 2018).

Excavations in dry shelters in and near the region have revealed a rich and varied material culture associated with the late Archaic and Late Prehistoric periods. Aside from a suite of stone tools and ceramics, pointed sticks, wooden shaft straighteners, split-yucca fireboards, fire drills, atlatls, throwing sticks, wooden scoops and tongs, pouches and blankets of rabbit fur and sewed skins, basketry, sandals, and vessels made from gourds, are recorded from dry shelters (Simmons et al. 1989). Very little evidence of cultivation has been found in the eastern Trans-Pecos region, unlike the agricultural groups that developed in the western portion of the region. Late Prehistoric groups appear to have continued to rely on desert succulents and hunting for subsistence into the Historic Period.

Historic Period (ca. 500-50 years ago)

Native groups in Texas first encountered Europeans during the mid- to late-1500s when several Spanish entradas passed through the Trans-Pecos region. Efforts to settle the lands by the Spanish were slow due to the barren terrain (Simmons et al. 2004). During the 1600s, Spanish colonization efforts increased with establishment of missions and settlements along the Rio Grande and in the La Junta district (Miller and Kenmotsu 2004). After the Pueblo Revolt of 1684 in New Mexico, approximately 2,000 Spanish refugees and Native Americans loyal to the Spanish were resettled in missions near the El Paso Lower Valley. These missions were abandoned when French forces landed on the Texas Gulf Coast forcing the Spanish to withdraw their forces from the frontier, and it wasn't until 1715 that efforts were made to reestablish the missions. A plan to defend the frontier of the Trans-Pecos region was implemented in 1729 with the construction of presidios to protect settlements from Apache and Comanche bands. Defensive efforts continued through Spanish, Mexican, and American administrations (Simmons et al. 2004).

The first permanent Anglo settlement in the area of Pecos County was the United States Army outpost Fort Stockton, established near Comanche Springs in 1859. The purpose of the army post was to protect

the San Antonio-El Paso Mail stage line. St. Gall, founded by Peter Gallagher, developed nearby into a supply center for the army, mail stages, travelers, and trains (Justice and Leffler 2018).

The fort provided protection for the mail routes, travelers, and freighters until 1861, when it was abandoned by federal troops after news came of Texas' secession from the Union (Wallace 2018; Cutrer 2018). It was re-occupied in that same year by Confederate Captain Charles L. Pyron and a regiment of Texas Mounted Rifles. In 1862, the fort was abandoned by the Confederates, and its ruins were reoccupied again after the Civil War by General Edward Hatch and made the headquarters for the Ninth United States Cavalry, a regiment of black troops (Wallace 2018).

Pecos County, originally a part of Bexar Territory, and, later, Presidio County, was established in 1871, and formally organized in 1875 (Justice and Leffler 2018). St. Gall became the county seat, and in 1880 was renamed Fort Stockton. That same year, the army post closed, causing an economic downturn. By 1900, the population of Pecos County was 2,360 and the economy was dominated by sheep and cattle ranching and corn was the dominant crop (Justice and Leffler 2018).

In 1913, the construction of the Kansas, Mexico, and Orient Railway Company of Texas rail across Pecos County stimulated the economy, resulting in population growth and increased land speculation. In an effort to attract land buyers, irrigation projects along the Pecos River were begun. In 1920, there were 207 farms in the area, the majority of which grew cotton and, to a lesser degree, sorghum (Justice and Leffler 2018). In 1927, the Yates oil field, one of the largest in the nation at the time, was discovered.

The economic boom caused by the oil field discovery led to the creation of the towns of Bakersfield, Red Barn, and Iraan to accommodate the influx of people. By 1930, the population reached 7,812, and the number of farms increased to 385 (Justice and Leffler 2018).

During the Great Depression, oil production helped stabilize the county's economy, although farmers were hit hard: the number of tenant farmers decreased from 198 in 1939 to 145 in 1940, and the number of farms decreased to 326 in 1940 (Justice and Leffler 2018). Construction of paved roads began in 1930, and by 1931, US Hwy 290 and SH 82 reached Fort Stockton. In 1956, US Hwy 290 connected Fort Stockton to Big Bend National Park, boosting tourism in the area. Oil and gas production continues to play an important role in the economy (Justice and Leffler 2018).

2.7.2 Literature and Records Review

Historical and archeological data for the study area were reviewed online through the THSA, TASA, and TARL. GIS shapefiles identifying the locations of previously recorded archeological sites were requested from TARL. GIS data from TARL were used to map cultural resource site locations within the study area. Previously recorded cultural resource site data available online from the THSA and TASA were obtained to identify locations of designated historical sites, State Antiquities Landmarks (SALs), cemeteries, HTCs, and OTHMs within the study area, as well as previously conducted cultural resource investigations. The TxDOT historic bridges database was also reviewed for bridges that are listed or determined eligible for listing on the NRHP (TxDOT 2018b). The NPS databases and websites pertaining to NRHP, National Historic Trails, and National Historic Landmark properties were also reviewed to locate and define boundaries for historic properties recorded at the national level (NPS 2018a, 2018b, and 2018c). The results of the review are summarized in Table 2-12.

TABLE 2-12 RECORDED CULTURAL RESOURCES WITHIN THE STUDY AREA

ARCHEOLOGICAL SITES	NRHP-LISTED RESOURCES	NRHP DETERMINED - ELIGIBLE RESOURCE	STATE ANTIQUITIES LANDMARKS	CEMETERIES	OTHM
256	1	34	10	6	20

Source: THC 2018b and 2018c.

Review of the THC and NPS data indicated that one NRHP-listed resource, the Fort Stockton Historical District, is located within the study area. The Fort Stockton army post was one of several army posts established in Texas to defend settlers from Indian attacks and protect the San Antonio-San Diego stage line. Established in 1858, the fort was also the site of an experimental military camel detachment. As discussed earlier, the fort was abandoned by Union forces after Texas seceded from the Union and reoccupied by Confederate forces during the Civil War. After the Civil War the fort was rebuilt, and eventually abandoned in 1886. Four fort buildings, including three structures that functioned as officer quarters and a guard house are in the historical district, as well as the fort cemetery, no longer in use. Two stone foundations remain where the enlisted barracks once stood. The St. Stephens Episcopal Church, Annie Riggs Hotel, a Victorian structure located at the site of the army post hospital, several historic stores, and Comanche Springs are all located in the district (NRHP 1972). Portions of site 41PC71, the archeological component of the Fort Stockton military post, are included in the historic district boundary.

The review of the TASA (THC 2018b), and TARL data indicates that 256 archeological sites have been previously recorded in the study area (see Table 2-13). Of these, 233 are prehistoric in age, nine are

historic, eight contain historic and prehistoric components, the age of two sites is undetermined, and no descriptive data is available for four sites. Seventeen archeological sites have been determined ineligible for listing in the NRHP by the State Preservation Historic Officer (SHPO). Thirty-four sites have been determined by the SHPO to be eligible for listing in the NRHP, nine of which (41PC75, 41PC76, 41PC77, 41PC78, 41PC80, 41PC81, 41PC82, 41PC83, and 41PC84) are designated as SALs. Site 41PC14 has also been designated a SAL but has not been formally assessed for listing on the NRHP.

Of the 34 sites that have been determined eligible for listing on the NRHP, 30 are prehistoric, one is historic, and two have both prehistoric and historic components. Site 41PC79 is a campsite containing a ring midden, hearths, and burned rock dating at least to the late Archaic. Turpin (2009; Turner and Turpin 2012) suggests that sites 41PC79, 41PC442, 41PC443 and several nearby sites and hearths should be considered one site that was concentrated around Escondido Springs. Site 41PC443 is an early through late Archaic campsite with hearths, burned rock mounds, and a ring midden. Lithic tools, gouges, scrapers, projectile points, debitage, and scattered burned rock are recorded from the site (THC 2018b). Site 41PC442 also is a prehistoric campsite with hearths, burned rock middens, stone tools (i.e., gouges and scraper) and debitage.

Many of the prehistoric determined-eligible sites are campsites that contain burned rock features, most of which have been dispersed, to some degree, by erosion. Sites 41PC603 and 41PC604 have concentrations of burned rock that are interpreted as burned rock middens that have been dispersed by erosion. The sites have a small amount of debitage, but lack time-diagnostic artifacts. Three burned rock concentrations that have been dispersed by erosion are also recorded at site 41PC605, along with debitage and two scrapers. Four hearths that have been dispersed by erosion and debitage are reported from site 41PC606 (Turpin 2009). A burned rock concentration, scattered burned rock, hearth and debitage are reported from site 41PC610 (THC 2018b and 2018c). Two deflated burned rock mounds that have been dispersed by runoff, and a dispersed burned rock concentration are reported from site 41PC612, along with naturally occurring chert and one stone tool, a spokeshave (THC 2018b and 2018c). Two hearths are reported from both site 41PC613 and 41PC614, along with debitage. Site 41PC834 has a similar assemblage along with three hearths. Seven hearths, burned rock, scrapers and debitage are reported from site 41PC829. Five hearths are reported from 41PC839, which include burned rock, debitage, scrapers, bifaces, and one historic artifact, a jar.

Bedrock mortars, four concentrations of burned rock, an Abasolo projectile point, debitage, various stone tools and projectile point fragments are reported from 41PC831, which dates, at least in part, to the early

to middle Late Archaic periods. Prehistoric ceramics are reported from two sites in the study area, only one of which, 41PC832, has been determined eligible for listing on the NRHP. Eight burned rock concentrations, a Langtry-like projectile point, groundstone implements, and various stone tools are also reported from the site.

Scattered burned rock and debitage are reported from 41PC615, as well as a variety of projectile points that suggest the site was revisited from the early Archaic to the Late Prehistoric period. Historic-era telephone poles and ceramic insulators are also reported from the site (Turpin 2009). Site 41PC643 has six depressions near what may have been interiors of tipis, with a small scatter of burned rock and debitage, and associated rock shelter. Four large burned rock mounds and three concentrations of burned rock are reported from site 41PC645, as well as a scatter of burned rock, debitage, stone tools, and projectile points. Projectile points from the site suggest it dates, at least in part, to the late Archaic and Late Prehistoric periods (THC 2018b; Turpin 2009). A rock ring measuring between three and four meters in diameter and debitage are reported overlooking a bluff at 41PC409.

Site 41PC611 is a lithic procurement site around a small chert outcrop (Turpin 2009; Turner and Turpin 2012). Materials at the site include tested cobbles, debitage and rough tools, and debitage. A fragment of an aqua glass insulator was also found at the site, possibly associated with a nearby historic-era telegraph line (Turpin 2009).

Sites 41PC607, 41PC608, 41PC644 are rockshelter sites that have been determined eligible for listing on the NRHP. Burned rock is reported from all of the rockshelter sites. Debitage is reported from 41PC607, and a burned rock midden is reported at 41PC408. Midden soil are reported from site 41PC644. A rock ring measuring between three and four meters in diameter overlooking a bluff and debitage are reported from 41PC409.

Site 41PC616 is the Old Spanish Trail, visible as a line of vegetation. This site is a portion of the trail that stretched from San Antonio to El Paso and dates from the Spanish Colonial period to the 1920s (THC 2018b and 2018c).

Sites 41PC75, 41PC76, 41PC77, 41PC78, 41PC80, 41PC81, 41PC82, 41PC83, and 41PC84 have also been designated SALs in addition to being determined eligible for the NRHP (THC 2018b). All of these sites are prehistoric. Sites 41PC75, 41PC76, 41PC77, 41PC78, and 41PC80 are late Archaic to Late Prehistoric period campsites, each with a large ring midden and associated hearths. Sites 41PC81,

41PC82, and 41PC83 each contain an open circle of rocks and debitage, and likely date to the late Archaic and/or Late Prehistoric periods. Bedrock mortars were observed at sites 41PC82 and 41PC83. Site 41PC84 is a small rock shelter site with associated midden. The Squawteat Peak Site (41PC14) includes seven occupation areas and a lithic procurement area. Excavations at the site recorded ring middens, hearths, wiki up rings, mortar holes, and a quarry (THC 2018b; Turpin 2009).

Six cemeteries (Table 2-14) and 20 OTHMS (Table 2-15) are recorded in the study area. None of the cemeteries are designated HTC's. One OTHM is located at The Old Fort Cemetery. The cemetery is located within the Fort Stockton Historic District and was opened in 1859 as a burial ground for soldiers stationed at Fort Stockton. After the fort was closed, the remains of 56 soldiers buried at the cemetery were moved to Fort Sam Houston in San Antonio (THC 2018b). Twelve of the OTHMS are Recorded Texas Historical Landmarks (RTHLs) commemorating notable buildings, including the Annie Riggs Hotel, two churches, a school, a bank, and two stores closely tied to the local history.

A review of the TxDOT list of NRHP-eligible and listed ridges resulted in one NRHP determined-eligible bridge in the study area. The Tunis Creek Bridge was constructed in 1933 by the Lone Star Construction Company of San Antonio. The bridge is on the original alignment of SH 27, previously the Old Spanish Trail spanning the Tunis Creek. The bridge has been determined eligible for the NRHP due to its engineering significance as an example of a standard plan reinforced concrete girder bridge that was designed in the 1930s by the State Highway Department (TxDOT 2018b). The 741-foot-long Tunis Creek Bridge is the longest intact concrete girder bridge of the period (NRHP 2018).

TABLE 2-13 RECORDED ARCHEOLOGICAL SITES WITHIN THE STUDY AREA

TRINOMIAL	NRHP STATUS	SITE DESCRIPTION
41PC1	undetermined	campsite with two hearths, burned rock, debitage, and stone tools and the remains of historic structures and metal artifacts
41PC14	SAL/Eligible	open prehistoric campsite with several "occupation areas"
41PC15	undetermined	campsite with burned rock, debitage, and two projectile points
41PC16	undetermined	campsite with burned rock concentration, possibly a ring midden
41PC17	undetermined	campsite with ring midden, debitage, and burned rock
41PC18	undetermined	campsite with scattered burned rock and debitage
41PC19	undetermined	campsite with hearth, scattered burned rock
41PC20	undetermined	campsite with burned rock midden
41PC31	undetermined	pictograph site
41PC32	undetermined	pictograph site
41PC33	undetermined	pictograph site
41PC60	undetermined	large rockshelter with pictographs

TABLE 2-13 RECORDED ARCHEOLOGICAL SITES WITHIN THE STUDY AREA

TRINOMIAL	NRHP STATUS	SITE DESCRIPTION
41PC69	undetermined	campsite with debitage, possible hearths
41PC71	undetermined	Fort Stockton military post
41PC75	SAL/Eligible	campsite with ring midden and associated hearths
41PC76	SAL/Eligible	campsite with ring midden
41PC77	SAL/Eligible	campsite with ring midden
41PC78	SAL/Eligible	campsite with ring midden
41PC79	Eligible	early to late Archaic campsite with hearths, burned rock middens, debitage, and a historic dump
41PC80	SAL/Eligible	campsite with ring midden, dart point fragments, and debitage
41PC81	SAL/Eligible	campsite with rock circle and stone tools
41PC82	SAL/Eligible	campsite with rock circle and bedrock mortars
41PC83	SAL/Eligible	campsite with rock circle and bedrock mortars
41PC84	SAL/Eligible	rockshelter
41PC384	undetermined	rock shelter with debitage and stone tools
41PC385	undetermined	rock shelter with debitage, and pictographs
41PC386	undetermined	rock shelter with pictographs, petroglyphs, and debitage
41PC387	undetermined	campsite with ring midden, burned rock, and debitage
41PC388	undetermined	cave with burned rock, debitage, cores, and possible mortar holes
41PC393	undetermined	campsite with dispersed hearth and debitage
41PC394	undetermined	lithic scatter with projectile points, a piece of red sandstone, stone tools, and debitage
41PC419	no records	no site form available
41PC434	undetermined	lithic scatter
41PC435	undetermined	debitage (isolated find)
41PC436	undetermined	debitage (isolated find)
41PC437	undetermined	debitage (isolated find)
41PC438	undetermined	debitage (isolated find)
41PC439	undetermined	debitage (isolated find)
41PC440	undetermined	core (isolated find)
41PC441	undetermined	campsite with burned rock and debitage
41PC442	Eligible	campsite with hearths, burned rock middens, stone tools, and debitage
41PC443	Eligible	campsite with hearths, burned rock middens, ring midden, stone tools, and debitage
41PC446	undetermined	no site form available
41PC447	undetermined	no site form available
41PC448	undetermined	no site form available
41PC454	undetermined	midden and hearth
41PC477	undetermined	rockshelter with petroglyphs and burned rock
41PC478	undetermined	late Archaic campsite with hearths, Paisano dart point, debitage, and stone tools
41PC479	undetermined	campsite with burned rock midden
41PC515	Ineligible	lithic scatter
41PC516	Ineligible	lithic scatter
41PC517	undetermined	campsite with burned rock midden and debitage
41PC518	Ineligible	possible Paleoindian lithic scatter with possible Angostura dart point and debitage
41PC519	Ineligible	lithic scatter
41PC520	undetermined	campsite with two small burned rock middens and debitage

TABLE 2-13 RECORDED ARCHEOLOGICAL SITES WITHIN THE STUDY AREA

TRINOMIAL	NRHP STATUS	SITE DESCRIPTION
41PC521	undetermined	campsite with burned rock midden and debitage
41PC522	undetermined	campsite five burned rock middens and debitage
41PC525	undetermined	lithic scatter
41PC526	undetermined	campsite with two middens, hearth, projectile points, and debitage
41PC527	undetermined	middle to late Archaic campsite with two burned rock middens, debitage, Langtry projectile point, and Paisano projectile point
41PC528	undetermined	limestone cairn used by early 20th century air force pilots to mark route between El Paso and San Antonio
41PC529	undetermined	campsite with hearths and debitage
41PC579	undetermined	early and late Archaic campsite with debitage, projectile points, and tools
41PC580	undetermined	lithic scatter
41PC581	undetermined	campsite with hearth, debitage, Zorra and Shumla projectile points, preforms, and stone tools
41PC582	undetermined	early Archaic and late Archaic lithic scatter with Frio and Shumla dart points, and stone tools
41PC583	undetermined	middle Archaic campsite with hearth, debitage, Travis, Langtry and untyped projectile points, and stone tools
41PC584	undetermined	Late Prehistoric campsite with three hearths, stone tools, debitage, and Perdiz projectile point
41PC585	undetermined	early and late Archaic campsite with lithic scatter, Pandale and Nolan projectile points, stone tools, and burned rock
41PC586	undetermined	early through late Archaic lithic scatter with Pandale, Tortugas and Shumla projectile points, bifaces, and debitage
41PC587	undetermined	early Archaic campsite with a large ring midden, Baker and Pandale projectile points, stone tools, and debitage
41PC588	undetermined	late Archaic/Late Prehistoric campsite with a ring midden, Frio projectile points, stone tools, and debitage
41PC589	undetermined	middle Archaic campsite with stone tools, debitage, and hearth and ring midden
41PC590	undetermined	lithic scatter with debitage and stone tools; historic fence line with wire remnants and three large limestone boulders anchoring a fence post.
41PC591	undetermined	campsite with stone tools, projectile points, debitage, and hearth and ring middens
41PC592	undetermined	lithic scatter with debitage and stone tools
41PC593	undetermined	campsite with burned rock ring midden and lithic scatter
41PC594	undetermined	early Archaic and Late Prehistoric and Archaic campsite with burned rock midden, debitage, hearth, Gower projectile point, untyped projectile point, and stone tools
41PC598	undetermined	middle Archaic campsite with burned rock and debitage, stone tools, Pandale projectile point
41PC599	undetermined	campsite with burned rock and debitage
41PC600	undetermined	campsite with burned rock, debitage and historic scatter with glass, cans, horseshoe, and bucket
41PC601	undetermined	Late Prehistoric campsite with debitage, burned rock, and ceramics
41PC602	undetermined	lithic scatter with debitage, bifaces
41PC603	Eligible	campsite with burned rock midden and debitage
41PC604	Eligible	campsite with burned rock concentration and debitage
41PC605	Eligible	campsite with three hearths, debitage and stone tools

TABLE 2-13 RECORDED ARCHEOLOGICAL SITES WITHIN THE STUDY AREA

TRINOMIAL	NRHP STATUS	SITE DESCRIPTION
41PC606	Eligible	campsite with four hearths and debitage
41PC607	Eligible	rockshelter with burned rock
41PC608	Eligible	rockshelter with burned rock and midden
41PC609	Eligible	campsite rock ring with debitage
41PC610	Eligible	campsite with burned rock midden, hearth, and debitage
41PC611	Eligible	lithic procurement area
41PC612	Eligible	campsite with two burned rock middens and a possible spokeshave tool
41PC613	Eligible	campsite with burned and debitage
41PC614	Eligible	campsite with two hearths and debitage
41PC615	Eligible	campsite with hearths, burned rock middens and early telephone line
41PC616	Eligible	Old Spanish Trail
41PC617	undetermined	stage stop, military outpost of Fort Stockton, early ranch
41PC621	undetermined	campsite with three rock rings and debitage
41PC625	undetermined	campsite with hearth and debitage
41PC626	undetermined	campsite with hearth and debitage
41PC627	undetermined	lithic procurement area
41PC629	undetermined	campsite with hearth and debitage
41PC630	undetermined	lithic procurement area
41PC631	undetermined	campsite with ring midden
41PC632	undetermined	historic ranch site with four corrals, four structures, three water reservoirs, and associated fences
41PC634	undetermined	campsite with burned rock middens, bedrock mortars, debitage, and stone tools
41PC643	Eligible	campsite with debitage, stone tools, manos, burned rock, possible tipi rings, and small rockshelter
41PC644	Eligible	small rock shelter with burned rock
41PC645	Eligible	late Archaic to Late Prehistoric campsite with one large burned rock midden, three smaller middens, three hearths, Palmillas projectile points, arrow point fragments, and debitage
41PC656	undetermined	campsite with hearth and debitage
41PC657	undetermined	campsite with hearth and debitage
41PC658	undetermined	campsite with debitage, stone tools and burned rock
41PC659	undetermined	campsite with debitage, stone tools and burned rock
41PC661	undetermined	rock shelter with burned rock
41PC662	undetermined	two rock shelters with petroglyphs, pictograph, and burned rock
41PC663	undetermined	rock shelter with burned rocks and debitage
41PC671	undetermined	donut-shaped stacked rocks/cairns; other rocks arranged to form 2-foot-high letters of the alphabet that appear to spell names - 'pe??', 'tdrrfi', and 'pedro'.
41PC672	undetermined	campsite with two burned rock middens with one dart point and other stone tools
41PC673	undetermined	late Archaic campsite with two burned rock middens, five hearths and a side-notched projectile point
41PC674	undetermined	campsite with hearth, debitage, and stone tools
41PC675	undetermined	campsite with 15 hearths
41PC676	undetermined	rock cairn with burned rock
41PC677	undetermined	rock shelter with stone tools and burned rock

TABLE 2-13 RECORDED ARCHEOLOGICAL SITES WITHIN THE STUDY AREA

TRINOMIAL	NRHP STATUS	SITE DESCRIPTION
41PC678	undetermined	campsite and lithic procurement site with debitage, stone tools, tested cobbles, burned rock, and a hearth
41PC679	undetermined	campsite with hearth
41PC680	undetermined	campsite with burned rock midden, three hearths, and stone tools
41PC681	undetermined	campsite with a hearth
41PC682	undetermined	campsite with three hearths
41PC683	Ineligible	campsite with stone tools, debitage, and burned rock
41PC684	Ineligible	campsite and lithic procurement site with debitage, burned rock, and two hearths
41PC685	Ineligible	campsite with hearth and debitage
41PC686	Ineligible	campsite with hearth, debitage, and stone tools
41PC687	Ineligible	projectile point fragment and historic button back, rifle shells, bottle glass, white ware, brick fragments, cast iron fragments, railroad spikes, nails, and metal
41PC688	undetermined	lithic scatter
41PC689	undetermined	lithic scatter
41PC690	undetermined	lithic scatter
41PC703	undetermined	limestone cairn
41PC704	undetermined	campsite with scattered burned rock and stone tools
41PC705	undetermined	campsite with multiple hearths
41PC706	undetermined	campsite with burned rock midden
41PC707	undetermined	lithic procurement area
41PC708	undetermined	campsite with multiple hearths and lithic scatter
41PC709	undetermined	campsite with burned rock midden
41PC710	undetermined	campsite with two hearths, debitage, and stone tools
41PC711	undetermined	campsite with four hearths
41PC712	undetermined	lithic procurement area
41PC713	undetermined	lithic scatter
41PC714	undetermined	campsite with debitage, stone tools, and scattered burned rock
41PC715	undetermined	lithic scatter
41PC716	undetermined	campsite with burned rock midden and debitage
41PC717	undetermined	campsite with debitage, dart point, and burned rock
41PC718	undetermined	campsite with debitage, stone tools, and burned rock
41PC719	undetermined	campsite with debitage, burned rock, and two historic dumps
41PC720	undetermined	campsite with hearths, debitage, and stone tools
41PC721	undetermined	middle Archaic campsite with hearth, debitage, and Pandale projectile point
41PC722	undetermined	lithic procurement area
41PC723	undetermined	campsite with three hearths and debitage
41PC724	undetermined	campsite with burned rock midden, hearth, debitage, dart point fragment and stone tools
41PC725	undetermined	campsite with debitage and burned rock
41PC726	undetermined	campsite with debitage, stone tools, and burned rock
41PC727	undetermined	campsite with midden debitage and stone tools
41PC728	undetermined	campsite with debitage, stone tools, Frio projectile point, and ground stone tools
41PC729	undetermined	campsite with burned rock midden and burned rock scatter
41PC730	undetermined	campsite with burned rock and debitage
41PC731	undetermined	middle Archaic campsite and lithic procurement area with hearth, Langtry dart point, and

TABLE 2-13 RECORDED ARCHEOLOGICAL SITES WITHIN THE STUDY AREA

TRINOMIAL	NRHP STATUS	SITE DESCRIPTION
		debitage
41PC732	undetermined	campsite with hearth anddebitage
41PC733	undetermined	campsite withdebitage, stone tools, and burned rock
41PC734	undetermined	campsite withdebitage, stone tools, and burned rock
41PC736	undetermined	lithic scatter
41PC737	undetermined	lithic scatter
41PC738	undetermined	lithic scatter
41PC739	undetermined	lithic scatter
41PC740	undetermined	lithic scatter
41PC741	undetermined	lithic scatter
41PC742	undetermined	lithic scatter
41PC743	undetermined	lithic scatter
41PC744	undetermined	lithic scatter
41PC745	undetermined	lithic scatter
41PC746	undetermined	lithic scatter
41PC747	undetermined	lithic scatter
41PC748	undetermined	lithic scatter
41PC749	undetermined	dump site with metal cans, fragments of blue and brown glass, fiesta ware and other ceramics, and a fragment of a bleach bottle
41PC761	Ineligible	campsite with burned rock and stone tool fragment
41PC762	Ineligible	campsite with burned rock scatter and stone tool fragment
41PC763	Ineligible	lithic procurement site
41PC764	undetermined	campsite with three hearths,debitage, and stone tools
41PC765	undetermined	lithic procurement area
41PC766	undetermined	lithic scatter
41PC767	undetermined	lithic scatter
41PC771	undetermined	campsite with burned rock midden,debitage, and stone tools
41PC772	undetermined	lithic procurement area
41PC773	undetermined	campsite with burned rock midden,debitage, and stone tools
41PC774	undetermined	lithic procurement area
41PC775	undetermined	early Archaic campsite with hearth,debitage, stone tools, and Gower projectile point
41PC776	undetermined	campsite with two hearths, dart point fragment,debitage, and stone tools
41PC777	undetermined	campsite withdebitage and stone tools
41PC778	undetermined	campsite with two burned rock middens, five hearths, anddebitage
41PC779	undetermined	campsite with two burned rock middens, multiple hearths,debitage, and stone tools
41PC780	undetermined	middle Archaic campsite with burned rock midden, three hearths,debitage, stone tools, and a Pandale dart point
41PC781	undetermined	lithic procurement area
41PC782	undetermined	campsite with two hearths
41PC783	undetermined	campsite with two burned rock middens, four hearths, anddebitage
41PC784	undetermined	campsite with nine hearths,debitage, and stone tools
41PC785	undetermined	campsite with four hearths,debitage, and stone tools
41PC786	undetermined	campsite with two hearths and a stone tool
41PC787	undetermined	campsite with burned rock midden,debitage, and a stone tool

TABLE 2-13 RECORDED ARCHEOLOGICAL SITES WITHIN THE STUDY AREA

TRINOMIAL	NRHP STATUS	SITE DESCRIPTION
41PC788	undetermined	campsite with two hearths, debitage, and stone tools
41PC789	undetermined	campsite with burned rock midden, debitage, and stone tools
41PC790	undetermined	campsite with hearth, debitage, and dart point fragment
41PC791	undetermined	late Archaic campsite with burned rock midden, Figueroa dart point, dart point fragments, debitage, and stone tools
41PC792	undetermined	campsite with three hearths, debitage, and stone tool
41PC793	undetermined	campsite with hearth, debitage, and stone tools
41PC794	undetermined	campsite with burned rock midden, two hearths, metate, debitage, and stone tools
41PC795	undetermined	campsite with two burned rock middens, burned rock concentrations, debitage, and stone tools
41PC796	undetermined	campsite with burned rock midden hearth, debitage, and a stone tool
41PC797	undetermined	campsite with hearth, debitage, stone tools, and a clam shell scraper
41PC798	undetermined	campsite with three hearths and debitage
41PC799	undetermined	campsite with burned rock midden, two hearths, debitage, and a stone tool
41PC800	undetermined	campsite with two burned rock middens, debitage and stone tools
41PC801	undetermined	campsite with two burned rock middens and multiple hearths, debitage, and stone tools
41PC802	undetermined	lithic scatter
41PC803	undetermined	middle Archaic lithic scatter with Pandale projectile point
41PC804	undetermined	campsite with burned rock midden, multiple hearths, debitage, and stone tools
41PC805	undetermined	campsite with two hearths, a dart point, and stone tools
41PC806	undetermined	campsite with burned rock, debitage, and stone tools
41PC813	undetermined	lithic procurement area at chert outcrop
41PC817	undetermined	windmill, rectangular concrete water tank, trough, and earthen dam and scatter of modern beer glass and sucker rod
41PC818	undetermined	campsite/hearthfield with 33 hearths, burned rock, groundstone, bifaces, projectile points, Ensor projectile point, and debitage
41PC819	undetermined	rock shelter and associated scatter of burned rock and a biface
41PC820	Ineligible	campsite with one hearth, biface, and burned rock
41PC821	undetermined	rock cairn, possible burial
41PC822	undetermined	rock cairn, possible burial
41PC823	Ineligible	campsite with five hearths, burned rock, and debitage
41PC824	undetermined	campsite with burned rock, debitage, projectile point, and bifaces
41PC825	undetermined	railroad grade
41PC827	undetermined	campsite with 16 hearths, three burned rock middens and debitage
41PC828	Ineligible	depression (possible cattle tank) and scatter of cans, glass, semi-porcelain sherds, nails, wire cable, bricks, metal fragments, barrel hoops, and milled lumber
41PC829	Eligible	campsite with seven hearths, scatter of burned rock, debitage, and scrapers
41PC830	undetermined	campsite with one hearths and burned rock
41PC831	Eligible	campsite with four concentrations of burned rock, a cluster of bedrock mortars, debitage, burned rock, cores, bifaces, unifaces, manos, metates, an Abasolo projectile point, and two projectile point fragments
41PC832	Eligible	campsite with eight burned rock concentrations, debitage, cores, bifaces, unifaces, scrapers, hammerstone, Langtry-like projectile point, metate, metate fragments, and brownware ceramics

TABLE 2-13 RECORDED ARCHEOLOGICAL SITES WITHIN THE STUDY AREA

TRINOMIAL	NRHP STATUS	SITE DESCRIPTION
41PC833	Ineligible	campsite with debitage, cores, Hueco projectile point, uniface, and groundstone fragments
41PC834	Eligible	campsite with three hearths, burned rock, and debitage
41PC835	undetermined	campsite with three hearths and burned rock
41PC836	undetermined	campsite with three hearths and burned rock
41PC837	undetermined	campsite with two hearths, burned rock, biface, and debitage
41PC838	undetermined	campsite with seven hearths, scatter of burned rock, debitage, scraper, and biface
41PC839	Eligible	campsite with five hearths, burned rock, debitage, cores, bifaces, scrapers, and one jar (historic isolate)
41PC840	undetermined	campsite with one hearth, burned rock and a core
41PC841	undetermined	campsite with three hearths, debitage, cores, bifaces, uniface, and a Hueco projectile point
41PC842	undetermined	campsite with burned rock, debitage, Palmillas projectile point, core, uniface, and mano
41PC843	undetermined	campsite with two hearths, burned rock, cores, bifaces, uniface, scraper and debitage
41PC844	undetermined	campsite with one hearth and burned rock
41PC845	Ineligible	lithic scatter with debitage, cores, bifaces, and a uniface
41PC846	undetermined	campsite with one hearth, debitage, bifaces, and Langtry projectile point

Source: THC 2018b.

TABLE 2-14 CEMETERIES RECORDED WITHIN THE STUDY AREA

CEMETERY NUMBER	CEMETERY NAME	COUNTY	COMMENTS
PC-C009	Unknown (North of IH 10)	Pecos	
PC-C004	Girvin	Pecos	
PC-C005	Old Fort	Pecos	Official Texas Historical Marker
PC-C007	St. Joseph's Catholic	Pecos	
PC-C008	East Hill	Pecos	
PC-C014	McKenzie	Pecos	

Source: THC 2018b and 2018c.

TABLE 2-15 OFFICIAL TEXAS HISTORICAL MARKERS WITHIN THE STUDY AREA

NAME	COUNTY	DESIGNATION
Annie Riggs Hotel	Pecos	RTHL
Courthouse, Jail and Zero Stone	Pecos	RTHL
First Telephone Exchange	Pecos	
Fort Stockton Guard House	Pecos	RTHL
Fort Stockton Officers' Quarters	Pecos	RTHL
Grey Mule Saloon	Pecos	RTHL
Koehler's Saloon and Store	Pecos	RTHL
Oil and Gas Industry in Pecos County	Pecos	
Old Fort Cemetery	Pecos	
Oldest House	Pecos	RTHL
Pecos County	Pecos	
Rude, Mr. and Mrs. Isaac J.	Pecos	
Saint Stephen's Episcopal Church	Pecos	RTHL
Site of Comanche Springs	Pecos	
Fort Stockton	Pecos	
St. Joseph's Catholic Church	Pecos	RTHL
Telegraph Office and School	Pecos	RTHL
Young's Store	Pecos	RTHL
First National Bank Building	Pecos	RTHL
Fort Stockton, C.S.A.	Pecos	

Source: THC 2018b

The majority of the prehistoric archeological sites that have been recorded in the study area appear to be campsites with burned rock middens, and/or hearths in close proximity to springs, streams and river channels (Comanche Springs, Tunas Creek, Fourmile Draw); uplands adjacent to these channels; mesa edges and bluff lines overlooking the major draws; and rockshelters. For the few prehistoric sites in the study area that have produced diagnostic artifacts, most date to the Archaic period, perhaps not unexpected given the preponderance of sites with burned rock middens, which appear in this region beginning in the early Archaic Period and continue to be used into the Late Prehistoric period.

2.7.3 Previous Investigations

According to the TASA (THC 2018b), there have been at least 48 previously conducted cultural resource investigations within the study area boundaries (see Table 2-16). Most of these have been undertaken to fulfill Antiquities Code of Texas requirements on state-owned University Lands in the eastern part of the study area.

TABLE 2-16 PREVIOUS CULTURAL RESOURCE INVESTIGATIONS WITHIN THE STUDY AREA

INVESTIGATING AGENCY NAME	SURVEY/PROJECT NAME	SITE(S) RECORDED/VISITED
Southern Archaeological Consultants	A Cultural Resources Assessment and Archaeological Survey of a Proposed CO2 Pipeline on Public School Lands in Pecos and Terrell Counties, Texas (Keller 1998)	41PC479
Texas Department of Highways and Public Transportation 1971	Information not available on TASA	41PC18- 41PC20
Texas Department of Highways and Public Transportation, 1971	Information not available on TASA	
Texas Department of Highways and Public Transportation	An Archaeological Survey on Interstate Highway 10 — Crockett, Kimble, Pecos, Sutton Counties (Crawford 1973)	
Texas Department of Transportation	US 290: 1.0 Mi. East of Ft. Stockton, East 0.6 Mile (Lewis 1975)	41PC17
Texas Department of Transportation	Cultural Resources Assessment - IPE 17 - FM 1776: FM1450 South (TxDOT 1975)	
University of Texas of the Permian Basin, 1979	UT System Block 19, 160 acres	
University of Texas Land System	Report on Archeological Survey of Parts of Sections 8, 9, 12, and 13 of Block 19, University Lands, Pecos County, Texas (Barkes 1980)	41PC394
Information not available on TASA, 1979	Information not available on TASA	
Center for Archeological Research	Archaeological Investigations at Angus Flats, Pecos County, Texas (Gibson 1980)	41PC393
Heartfield, Price and Greene, Inc.	An Archeological Survey for Rio Grande Electric Cooperative, Inc. in Southern and Western Texas — Dimmit, Hudspeth, Kinney, Pecos, Terrell Counties (Gibson and Uecker 1981)	41PC393
Rural Electrification Agency, 1981	Information not available on TASA	
State Department of Highway and Public Transportation	Investigations at the Squawteat Peak Site, Pecos County, Texas (Young 1981)	41PC14
Mid-America Petroleum, 1985	41PC14 and Environs: well pads, access roads, pipelines	41PC14
Heartfield Price and Green	Cultural Resources Investigations	41PC434-41PC441

TABLE 2-16 PREVIOUS CULTURAL RESOURCE INVESTIGATIONS WITHIN THE STUDY AREA

INVESTIGATING AGENCY NAME	SURVEY/PROJECT NAME	SITE(S) RECORDED/VISITED
	of the Proposed Superior-University 19-1-1 Lateral Gas Pipeline Routes through U. T Lands (Escondido Vineyard), Pecos County, Texas (Madden 1983)	
State Department of Highways and Public Transportation	Spur 194: From Junction US 385 to 1.2 Miles SW (SDHPT 1987)	
Archeological Resource Evaluation Associates	Archaeological Investigation of a Proposed Prison Site near Belding, Texas (Kegley 1993)	
Public Utility Commission, 2000	Information not available on TASA	
PBS&J, 2000	Woodward Mountain	41PC515-41PC522
Hicks and Company, 2000	Pecos County Survey	41PC523, 41PC524
SWCA Environmental Consultants, Inc., 2000	Capitol Hill Wind Ranch	41PC525-41PC528
SWCA Environmental Consultants, Inc., 2000	Cultural Resources Survey for Sherbino Mesa Project	41PC579-41PC594
Center for Big Bend Studies	An Archeological Survey of the Proposed 102-Mile Six Shooter to Midland Airport Fiber Optic Cable Route, Pecos, Crockett, Upton, and Midland Counties, Texas (Young 2003)	41PC14, 41PC15
Turpin and Sons, Inc.	Cultural Resources Evaluation of Big Bend Telephone Company Fiber Optic Lines, Pecos County (Turpin 2005)	41PC393
Turpin and Sons, Inc.	Archeological Survey of Energy Transfer Corporation's Pinon Lateral, University Lands, Pecos County, Texas — Pecos County (Turpin 2007)	41PC598-41PC601
AR Consultants, Inc., 2007	Sherbino Mesa Wind Farm	41PC602
ERM Inc., 2009	Sherbino Mesa 2 Wind Farm	41PC625, 41PC630-41PC632
Turpin and Sons, Inc.	Archeological Investigations on University Lands, Blocks 18, 19, and 21, Pecos County, Texas (Turpin 2009)	41PC79, 41PC442, 41PC443, 41PC603-41PC616, 41PC643-41PC645, 41PC656-41PC663, 41PC671
Blackshare Environmental, 2010	Comanche Overhead Transmission Line	41PC688-41PC690

TABLE 2-16 PREVIOUS CULTURAL RESOURCE INVESTIGATIONS WITHIN THE STUDY AREA

INVESTIGATING AGENCY NAME	SURVEY/PROJECT NAME	SITE(S) RECORDED/VISITED
Turpin and Sons, Inc	An Archeological Survey of the Proposed Sandridge Tombstone 345-kV Transmission Line, University Lands, Pecos County, Texas (Turpin 2010)	41PC672-41PC687
Turpin and Sons, Inc.	Cultural Resource Assessment of 3.4 miles of BP Wind Energy North America Inc 's Sherbino Mesa Transmission Line Corridor on University Lands, Pecos County (Turpin 2011)	41PC479, 41PC703-41PC709, 41PC704-41PC 709
Turpin and Sons, Inc.	Cultural Resource Assessment, BP Wind Energy North America Inc.'s Sherbino Mesa Transmission Network, Pecos County, Texas (Turpin 2011)	41PC710-41PC712, 41PC715, 41PC17-41PC732, 41PC736-41PC745, 41PC746, 41PC749
LCRA	LCRA Annual Report of Cultural Resource Investigations for 2011 (Prikryl, Malof, and Hixson 2012)	41PC761, 41PC762
Turpin and Sons, Inc.	Cultural Resource Reconnaissance, University Lands VF Petroleum Seismic Project Pecos County, Texas (Turner and Turpin 2012)	41PC79, 41PC442, 41PC611, 41PC615, 41PC617, 41PC763-41PC767, 41PC783-41PC787
TRC Environmental Corporation	The City of Fort Stockton, Utility Installation, Pecos County, Texas: An Intensive Cultural Resource Survey, Pecos County, Texas (Quigg and Matchen 2014)	
Turpin and Sons, Inc.	An Archeological Reconnaissance of Dawson Geophysical Pecos Phase I Seismic Project Pecos County, Texas (Burgess and Moody 2014)	41PC384-41PC387, 41PC771-806, 41PC601, 41PC621, 41PC672, 41PC673-41PC675, 41PC678, 41PC683, 41PC684
Turpin and Sons, Inc., 2016	Trans Pecos (TPP)	41PC813
Information not available on TASA	Information not available on TASA	
Information not available on TASA	Information not available on TASA	
Information not available on TASA	Information not available on TASA	
Turpin and Sons, Inc	Negative Findings Report Cultural Resource Survey, Ft. Stockton Municipal Solid Waste Facility Pecos County, Texas (Turner and Turpin 2016)	

TABLE 2-16 PREVIOUS CULTURAL RESOURCE INVESTIGATIONS WITHIN THE STUDY AREA

INVESTIGATING AGENCY NAME	SURVEY/PROJECT NAME	SITE(S) RECORDED/VISITED
AECOM	Cultural Resources Survey for the Midway Solar Site Project, Pecos County, Texas (Ahr et al. 2017)	41PC761, 41PC762
AmaTerra Environmental, Inc	Archeological Resource Survey at a Proposed Deep Borehole Site, Pecos County, Texas (Butler and Seikel 2017)	41PC817-41PC820, 41PC823
Turpin and Sons, Inc.	Negative Findings Report, Cultural Resource Survey Ft. Stockton Fed-Ex Ground Property, Pecos County, Texas (Turpin 2017)	
Phase One Archaeological Services	Phase One Cultural Resource/Archaeological Investigation Results, Northern Natural Gas, Bakersfield Compressor Station Project, Pecos County, Texas (Hodgson 2017)	41PC821, 41PC822
Turpin and Sons, Inc.	Negative Findings Report Cultural Resource Survey, Woodward Wind Conduit Realignment Pecos County, Texas (Turner 2018)	41PC529
Lone Mountain Archaeological Services, Inc.	Cultural Resource Survey for the Proposed Sanderson 3D Seismic Project, Pecos County, Texas (Boggess and McCormack 2018)	41PC82841PC846
POWER Engineers	Intensive Archeological Survey of Portions of the Proposed AEP Barilla Junction to Permian Basin Transmission Line Rebuild Project Located on City of Fort Stockton Property in Pecos County, Texas (Schubert and Duke 2018)	41PC448

Source: THC 2018b.

2.7.4 High Probability Areas

Review of the previously recorded cultural resource sites data indicates that the study area has not been entirely examined during previous archeological and historical investigations. Consequently, the records review results do not include all possible cultural resources sites within the study area. To further assess and avoid potential impacts to cultural resources, HPAs for prehistoric archeological sites were defined during the route analysis process. HPAs were designated based on a review of the site and survey data within the study area, as well as soils and geologic data, and topographic variables. Within the study area, the prehistoric HPAs typically occur near and along streams, at the heads of major draws, in rock shelters near springs and at outcroppings of chert gravels suited to stone tool manufacture. Terraces and topographic high points that would provide flats for camping and expansive landscape views as well as access to fresh water sources are also considered to have a high probability for containing prehistoric archeological sites.

Historic age resources are likely to be found near water sources. However, they will also be located in proximity to primary and secondary transportation routes (e.g., trails, roads, and railroads) which provided access to the sites. Buildings and cemeteries are also more likely to be located within or near historic communities.

3.0 ALTERNATIVE ROUTE DEVELOPMENT

After defining the study area, the results of data collection and reconnaissance surveys were used to develop an environmental and land use composite constraints map to identify areas of opportunity and constraints for facilitating the development of geographically diverse preliminary alternative route segments to connect the project endpoints. The following sections describe the alternative route development process. The evaluation and comparison between the primary alternative routes is presented in Section 4.0.

3.1 OPPORTUNITIES AND CONSTRAINTS EVALUATION

3.1.1 Existing Linear Corridors

The PUC's Substantive Rules (16 TAC § 25.101(b)(3)(B)(i-iii)) require utilities to consider paralleling or utilizing existing compatible linear features when identifying route alternatives for new transmission lines. In general, locating a transmission line adjacent to existing linear corridors typically minimizes environmental impacts due to existing adjacent disturbances, improved access, and decreased habitat fragmentation. POWER identified multiple linear routing features within the study area, including: existing electrical transmission lines, roadways, active and abandoned railroads, fence lines, and apparent property boundaries. Although large petrochemical pipeline crossings and distances paralleling large petrochemical pipelines were identified, these were not considered positive routing features. Instead, POWER generally sought to minimize paralleling of large petrochemical pipelines and to cross such pipelines perpendicularly where possible and reasonable.

Transmission Line ROWs

POWER, LCRA TSC, and AEP Texas evaluated paralleling adjacent to existing transmission lines identified within the study area, which included one 345-kV transmission line, nine 138-kV transmission lines, and seven 69-kV transmission lines. During the route identification process, AEP Texas informed POWER that several of the existing 69-kV transmission lines have been rebuilt as 138-kV capable or are in the process of being rebuilt 138-kV capable. Opportunities for paralleling adjacent to some of the existing transmission lines were identified. In some instances, constraints located adjacent to the existing transmission lines, their location, or the orientation of these lines precluded paralleling adjacent to them.

Distribution Lines

POWER did not identify existing distribution lines within the study area that were considered viable for potential overbuild or paralleling opportunities for any significant distance of the Proposed Project.

Where potential overbuild opportunities exist for distribution facilities, co-location will be further evaluated during the detail design and construction stage of the Proposed Project in coordination with the owners and operators of the distribution facilities and will consider outage impact during reconstruction, cost allocation, and appropriate operation and maintenance agreements.

Roadway ROWs

POWER evaluated paralleling adjacent to multiple roadways within the study area, including one IH, three US Hwys, two SH, and six FM roads (a complete list of roadways is provided in Section 2.4.6). POWER also evaluated paralleling the numerous county and local roads (paved and unpaved) within the study area. Habitable structures, pipelines, oil or gas wells, and other constraints located near roadways precluded paralleling in some areas.

Railroad ROWs

POWER considered paralleling adjacent to both an active and abandoned railroad that were identified within the study area. The active railway primarily parallels SH 194 and existing transmission lines in the area and is located in the central portion of the study area running northeast to southwest. The abandoned railway is located in the northern portion of the study running northwest to southeast.

Pipeline ROWs

LCRA TSC and AEP Texas do not consider large pipelines carrying hydrocarbons to be a compatible routing feature for this project and paralleling such pipelines was avoided as much as possible. In addition, effort was made to cross the large petrochemical pipelines perpendicularly. Pipelines carrying hydrocarbons with a known diameter of six inches and greater are shown on Figures 3-14a, b, c and 4-1a, b, c.

Fence Lines

POWER identified paralleling opportunities within the study area along fence lines. Fence lines were identified from public roadways and utilizing aerial photography (Photo Science 2018) and were often found along apparent property boundaries.

Apparent Property Boundaries

LCRA TSC provided POWER with apparent property boundary information utilizing county appraisal district property information for Pecos County. Apparent property boundaries within the study area provided several paralleling opportunities between the project endpoints where no other existing linear features were present.

3.2 ALTERNATIVE ROUTE SELECTION

The objective of this EA study was to develop alternative routes that provide geographic diversity and comply with the routing criteria in § 37.056(c)(4) of the Texas Utilities Code, 16 TAC § 25.101(b)(3)(B), the PUC's CCN application form, and other requirements commonly included in the PUC's preliminary orders for transmission line CCN projects. The comments received from regulatory agencies, local officials, public meeting, and other interested stakeholders were also considered during the alternative route development process. Modifications and additions of preliminary alternative route segments were made while considering existing resources and public input. Feasible and geographically diverse alternative routes were selected for analysis and were compared using 46 evaluation criteria (see Table 2-1) to determine potential impacts to land use and environmental resources.

POWER utilized a comprehensive routing and evaluation methodology to develop and evaluate alternative transmission line routing segments. The POWER team identified feasible and geographically diverse locations for preliminary alternative route segments to connect the project endpoints that were then reviewed and further refined by LCRA TSC and AEP Texas for constructability. The preliminary alternative route segments were presented at a public open house meeting on July 12, 2018. Modifications to the proposed preliminary alternative route segments were completed after input was considered from the public open house meeting, additional agency input, meetings with stakeholders, refined data collection, field reconnaissance, and identified potential engineering constraints. The resulting alternative routing segments were combined to form numerous forward progressing alternative routes while also providing geographic diversity. An evaluation and comparative potential impact assessment for each alternative route was completed as provided in Section 4.0

The following sections provide a detailed description of the methodologies and assumptions used to complete the alternative route development process.

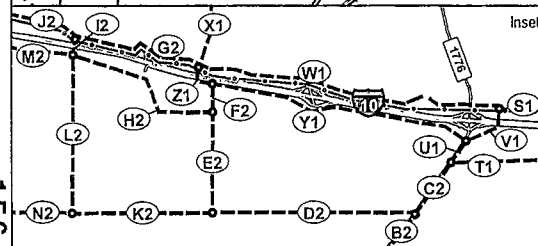
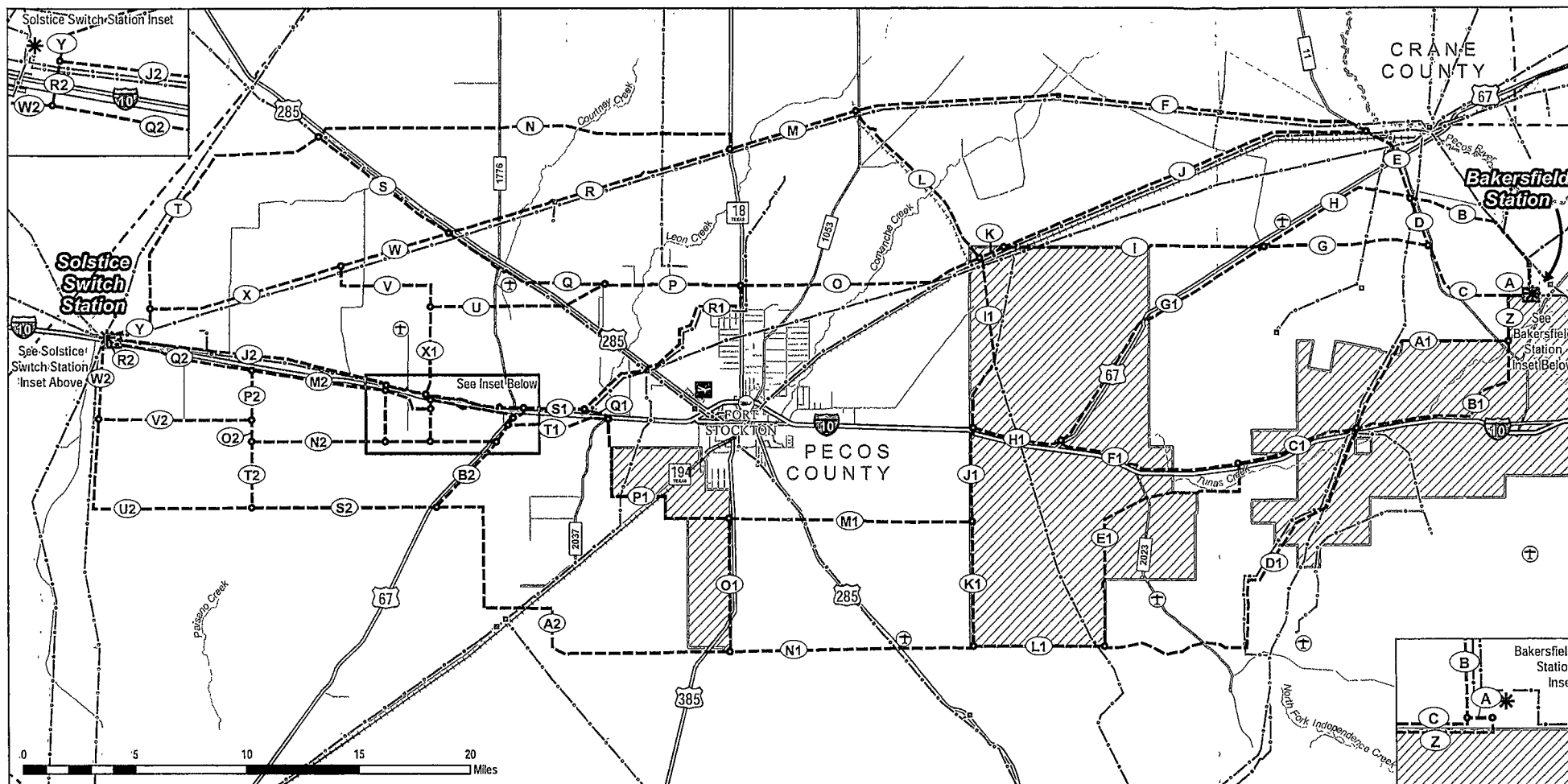
3.2.1 Preliminary Alternative Route Segments

Preliminary alternative route segments were identified by POWER using the composite constraints map. Preliminary alternative route segments were developed based upon maximizing the use of opportunity areas while avoiding areas of conflicting land uses or greater impact. Existing and newly flown aerial photography were used in conjunction with the composite constraints superimposed to identify locations for preliminary alternative route segments. POWER utilized the following to identify the preliminary alternative route segments:

- Input received from correspondence with local officials, regulatory agencies, and others.

- Input received from LCRA TSC and AEP Texas regarding existing and future transmission lines and electric generation projects within the study area and reliability concerns with paralleling certain existing transmission lines.
- Results from reconnaissance surveys of the study area.
- Review of aerial photography.
- Environmental and land use constraints data.
- Apparent property boundaries and fence lines.
- Existing compatible linear opportunity areas.
- Locations of existing housing, commercial, and oil and gas developments.

The preliminary alternative route segments were developed in accordance with § 37.056(c)(4) of the Texas Utilities Code 16 TAC § 25.101(b)(3)(B), the PUC's CCN application form, and other requirements commonly included in the PUC's preliminary orders for transmission line CCN projects. It was POWER's intent to develop an adequate number of environmentally acceptable and geographically diverse preliminary alternative route segments while considering such factors as community values, parks and recreation areas, historical and aesthetic values, environmental integrity, route length using or parallel to existing compatible corridors or parallel to apparent property boundaries, and prudent avoidance. POWER, LCRA TSC, and AEP Texas developed 75 preliminary alternative route segments that were presented at the public open house meeting (see Figure 3-1 and Appendix B).



Project Components * Project Endpoint A Preliminary Alternative Route Segment, Node and Label Study Area Existing Utilities ■ Existing Substation		Transportation Interstate Highway US Highway State Highway Farm-to-Market Road Local / County Road Railroad Railroad: Public Airport Private Airstrip Heliport		Administrative Boundaries County Boundary City Boundary University Land Surface Water River or Stream	
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Bakersfield to Solstice
345-kV Transmission Line Project
Figure 3-1
Preliminary Alternative
Route Segments

BOUNDLESS ENERGY

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3.2.2 Public Involvement Program

The purpose of the open house meeting, which was held on July 12, 2018, was to solicit input from residents, landowners, public officials, and other interested parties concerning the Proposed Project and the preliminary alternative route segments, and to:

- promote a better understanding of the Proposed Project including the purpose, need, potential benefits and impacts, and the PUC certification process;
- inform the public about the routing procedure, schedule, and route approval process; and
- gather the values and concerns of the public and community leaders.

3.2.2.1 Comments from Agencies and Officials

The following local, state, and federal agencies and officials were contacted by letter in January 2018 by POWER, LCRA TSC, and AEP Texas to solicit comments, concerns, and information regarding potential impacts, permits, or approvals for construction of the Proposed Project. Maps of the study area were included with each letter. Sample copies of the letters sent and all of the responses received as of the date of this report are included in Appendix A.

Contacts Made by POWER:

- United States Army Corps of Engineers (USACE) – Albuquerque District
- United States Department of Defense Siting Clearinghouse (DoD)
- United States Environmental Protection Agency (USEPA)
- United States Fish and Wildlife Service (USFWS)
- Federal Aviation Administration (FAA)
- Federal Emergency Management Agency (FEMA)
- National Park Service (NPS)
- Natural Resource Conservation Service (NRCS)
- Railroad Commission of Texas (RRC)
- Texas Commission on Environmental Quality (TCEQ) – Midland Region
- Texas Department of Transportation (TxDOT) – Aviation Division
- TxDOT – District Engineer - Odessa
- TxDOT – Environmental Affairs Division
- TxDOT – Planning and Programming
- Texas General Land Office (GLO)
- Texas Historical Commission (THC)
- Texas Parks and Wildlife Department (TPWD)

- Texas Water Development Board (TWDB)
- Permian Basin Regional Planning Commission
- Pecos County Historical Commission

Contacts Made by LCRA TSC and AEP Texas:

- AEP Wind Farm Operations
- Barrilla Solar
- BHE Renewables, LLC
- Buckthorn Westex, LLC
- Duke Energy Renewables Solar, LLC
- East Pecos Solar, LLC
- Midway Solar, LLC
- NextEra Energy, Inc.
- Recurrent Energy Development Holdings, LLC
- Sherbino I Wind Farm, LLC
- City of Fort Stockton Utilities
- Oncor Electric Delivery Company
- Rio Grande Electric Cooperative
- South Texas Electric Cooperative
- Southwest Texas Electric Cooperative
- Texas New Mexico Power Company
- Applicable United States Senators
- Applicable United States Congressmen
- Applicable Texas Senators
- Applicable Texas House Members
- Pecos County Officials
- City of Fort Stockton
- Buena Vista Independent School District (ISD)
- Fort Stockton ISD
- Iraan-Sheffield ISD
- Pecos County Chamber of Commerce
- Texas Office of Public Utility Counsel

All comments received were evaluated, considered, and factored into the overall evaluation of the preliminary alternative route segments and development of the alternative routes. Additionally, the information received from the agencies will be taken into consideration by LCRA TSC and AEP Texas before and during construction of the project. The following is a summary of the comments provided by federal, state, and local officials that responded as of this writing and the response to those comments where appropriate.

- The DoD Siting Clearinghouse responded with a letter dated May 23, 2018, stating that after an informal review the proposed transmission line project will have minimal impact on military operations conducted in the area. However, this informal review does not constitute an action under 49 U.S.C. § 44718 and the DoD is not bound by the conclusion arrived at under this informal review.
- The FAA responded with a letter dated February 14, 2018, stating that LCRA TSC and AEP Texas will need to determine if formal notice is required to the FAA under 14 CFR Part 77. LCRA TSC and AEP Texas will coordinate with the FAA as necessary once a route is approved for construction.
- The FEMA responded with a letter dated March 6, 2018, stating that they had no comments to offer.
- The GLO responded with a letter dated February 2, 2018 stating that the GLO does not appear to have any environmental or land use constraints associated with the project. The GLO also requested contact when a final route has been determined in order to determine if the project crosses any Permanent School Fund land or streambeds that would require an easement.
- The NRCS responded with a letter dated February 8, 2018, stating that although they did identify areas of prime farmland within the study area, they now consider the installation of transmission lines to be a minimal impact that will have no effect on productive agricultural lands. The Proposed Project is exempt from provisions of FPPA and no further consideration for protection is necessary. The NRCS also attached a Custom Soil Resource Report and cited several concerns to be considered, including depth of restrictive layer, slope gradient, and erosion potential. They encouraged the use of acceptable erosion control methods during the construction of the project.
- The USFWS responded with an email dated February 12, 2018, stating that species of concern could be identified by downloading information from the IPaC System. USFWS also recommended remaining in or as close to existing ROW to avoid any new potential habitat degradation. IPaC was downloaded August 16, 2018, and provided a list of threatened and endangered species that may occur within the project area and/or may be affected by the project.

- The TCEQ responded with an email dated February 5, 2018, stating that TCEQ Region 7 does not conduct Environmental Assessments for this type of project.
- The THC responded with a letter dated February 12, 2018, stating that the Proposed Project would cross an area containing several previously recorded archeological sites. They also stated that much of the study area has never been surveyed and recommended that the final proposed route be surveyed by a professional archeologist. If the survey is being performed on public land or within a public easement, an Antiquities Permit must be obtained before any investigations are undertaken.
- A TXNDD data request by POWER was fulfilled by TPWD on January 23, 2018, providing shapefiles and a list of species that could be impacted by Proposed Project activities if suitable habitat is present.
- The TPWD responded with an email dated February 7, 2018, requesting shapefiles and substation locations for the project. The TPWD responded with a letter dated March 9, 2018, providing a list of regulations pertaining to the project and numerous recommendations for the project to comply with these regulations.
- TxDOT's Planning and Development Division responded with a letter dated February 1, 2018, stating that TxDOT ROW contains ecologically sensitive areas on US Hwy 67 and SH 18, and that those areas should be avoided. Additionally, utility installation requests are required for accommodation of utility facilities on state highway ROW, and a request must be submitted through the TxDOT Utility Installation Review System. TxDOT also provided information pertaining to permits required for access connections to the state highway system, if necessary, along the selected route.
- The Permian Basin Regional Planning Commission responded with a letter dated February 22, 2018, stating they offer no comment regarding land use or other environmental concerns. They support the importance of contacting County Judge Joe Shuster and Mayor Chris Alexander in Fort Stockton, Texas.

3.2.2.2 Open House Meeting

The open house meeting on July 12, 2018, was held at the Pecos County Civic Center in Fort Stockton, Texas from 5:30 p.m. to 8:00 p.m. LCRA TSC and AEP Texas mailed a total of 1,440 written notices of the meeting to owners of property within 500 feet of each preliminary alternative route segment centerline (see Appendix B). Additional notice letters were sent to elected officials and other interested parties, including the DoD. In addition, a public notice was published on July 5, and 12, 2018 in the *Fort Stockton Pioneer*, a newspaper with general circulation within Pecos County. The public notices announced the

location, time, and purpose of the meeting. A copy of the published newspaper notice is located in Appendix B.

At the meeting, personnel from LCRA TSC, AEP Texas, and POWER staffed information stations with each station devoted to a particular aspect of the project. These stations included maps, illustrations, photographs, and text explaining a particular topic. A GIS station was available to show the extent of the project, the proposed preliminary alternative route segments, property ownership parcel boundaries, and recent aerial photography of the project area. The GIS station was available to answer detailed landowner property questions such as the distance from the proposed alternative route segment centerline to habitable structures. Interested attendees were encouraged to visit each station in order so that the entire process could be explained in the logical sequence of project development, although attendees were free to circulate throughout the room in any manner they preferred. The information station format is typically advantageous because it allows attendees to process information in a more relaxed manner and also allows them to focus on their particular area of interest and ask specific questions. Furthermore, the one-to-one discussions with POWER, LCRA TSC, or AEP Texas personnel typically encourage more interaction from those attendees who might be hesitant to participate in a more formal speaker-audience format.

Upon entering, visitors were asked to sign in and were handed an information packet including a questionnaire. The questionnaire solicited input on the Proposed Project and also included an evaluation of the information presented at the meeting. Also included in the information packet were answers to frequently asked questions and a map indicating the location of the preliminary alternative route segments. Copies of the questionnaire and information packet are located in Appendix B.

After the open house meeting, POWER reviewed and evaluated each questionnaire that was submitted at the meeting or that was sent in after the meeting. Of the 49 people that signed in at the open house meeting, a total of 16 submitted questionnaires at the meeting. Seven additional questionnaires were received from individuals after the meeting, some of whom did not attend the open house meeting. A total of 23 questionnaires were received by LCRA TSC and AEP Texas.

A review of the questionnaires indicated that the majority of the respondents agreed that the need for the project had been adequately explained (96%), and that the exhibits and information presented was helpful to them in understanding the project (83%). Nine (39%) of the questionnaires received indicated that the features on the Land Use and Environmental Constraints Map were accurately plotted. Fifteen

respondents (65%) indicated that they were not aware of any missing features on the Land Use and Environmental Constraints Map.

Respondents were asked if they had a concern with any particular preliminary alternative route segment as they were presented at the open house meeting (Appendix B and Figure 3-1). They were also asked to describe their concerns. Segments O, P, and Q received the most written negative concerns (two each), followed by Segments D1, P1, Q1, and T1 with one each. Segments F and X received the most written positive comments (three each), followed by Segments M, R, W, Y, and L1 with two each. Table 3-1 summarizes the segments that received the most responses to this question, both negative and positive.

TABLE 3-1 SEGMENT CONCERNS/COMMENTS

SEGMENTS	O, P, Q	D1, P1, Q1, T1	F, X	M, R, W, Y, L1
Negative Concerns	2	1	0	0
Positive Comments	0	0	3	2

The questionnaire also solicited comments concerning typical transmission line routing factors, such as land use, paralleling existing corridors, and community values/resources. The questionnaire asked the respondents to rank the factors from one (most important) to 10 (least important) from a list of features that included: reliable electric service; parallel existing transmission line ROW; parallel other existing compatible ROW; parallel property lines; maximize the distance from residences; historic sites; parks and recreational areas; minimize visibility of the lines; and minimize environmental impacts or other concerns. The factors with most importance regarding routing the proposed transmission line project include maintaining reliable service (30%), maximizing the distance from residences (22%), and paralleling other existing utility ROW (9%).

3.2.2.3 Internet Website

To better communicate with the public and provide up-to-date project information, LCRA TSC created a section on LCRA's main website that included project-specific information regarding the Proposed Project (<http://www.lcra.org/baksol>). Project information available on the website included:

- Project Questionnaire
- Open house invitations/newspaper ad
- Frequently Asked Questions
- Exhibits from the open house meeting
- Aerial photography and topographic maps depicting the study area and alternative routes

- Property ownership maps
- Interactive mapping tool that allows individuals to zoom in on the preliminary segments

3.3 Modifications to the Preliminary Alternative Route Segments

Information received by POWER, LCRA TSC, and AEP Texas from the public, officials, and agencies resulted in modifications to some of the preliminary alternative route segments as well as the identification of new route segments as described in detail below. The preliminary alternative route segments are presented in Figure 3-1. The primary alternative route segments resulting from the segment revisions described below are shown in Figure 3-13.

3.3.1 New Segments

Based on public comment, Segment Y2 was added near FM 1053 as an option to go around the mesa in that area. As a result of adding Segment Y2, two nodes were added near the end of Segment O, which resulted in relabeling the far western portion of the segment as Segments X2 and Z2 (Figure 3-2).

Segment A3 was added south of IH 10 as an option that would connect the eastern and western segment networks. As a result of adding Segment A3, a node was added near the middle of Segment E1, relabeling the southern portion of the segment as Segment C3. A node was also added near the top of Segment K1, relabeling the northern portion of the segment as Segment D3. The northern portion of K1 was modified to provide a perpendicular crossing of a natural gas pipeline (Figure 3-3).

3.3.2 Segment Modifications

The central portion of Segment T was modified by shifting it to the east due to oil and gas development. (Figure 3-4).

The central portion of Segment A1 was shifted to the southeast to keep the segment on one property (University Lands) (Figure 3-5).

The central portion of Segment T1 was modified by slightly shifting it to the north to provide a greater distance from the creek bed (Figure 3-6).

Based on public input, Segment X1 was modified by shifting it to the eastern property boundary. As a result of shifting Segment X1, a node was shifted to the middle of Segment U, which decreased the length

of Segment U and increased the length of Segment V. A node was also added near the end of Segment W1, relabeling the western portion of the segment as Segment B3 (Figure 3-7).

Segment P2 was modified by shifting it to the west to better parallel a roadway (Tinker Rd.). As a result of shifting Segment P2, a node was shifted to the middle of Segment Q2, which decreased the length of Segment Q2 and increased the length of Segment M2. A node was also shifted to the middle of Segment V2, which decreased the length of Segment V2 and increased the length of Segment O2 (Figure 3-8).

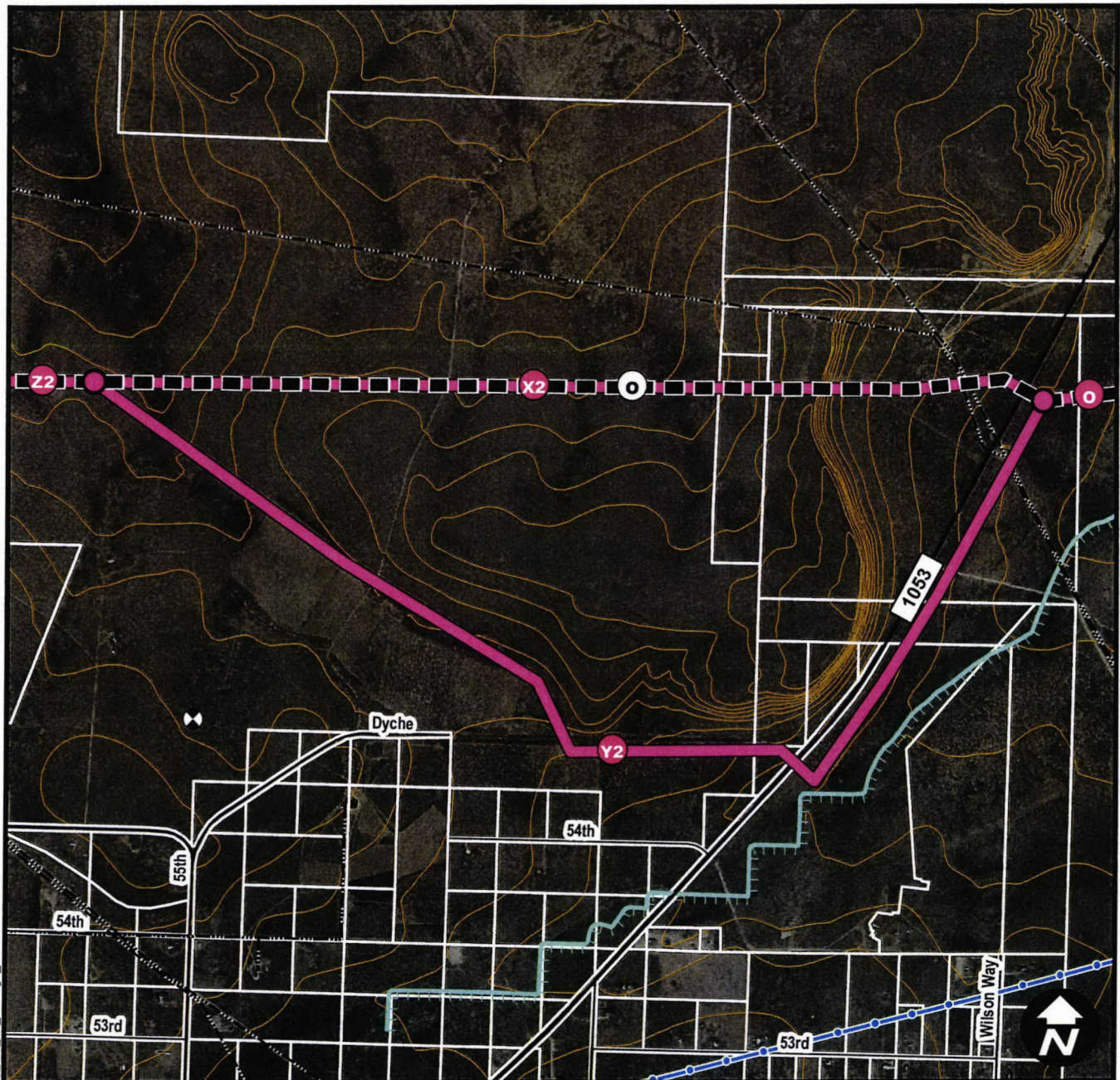
The northern portion of Segment L was modified by shifting it to the east to better parallel a roadway (FM 1053). As a result of shifting Segment L, the node was shifted slightly, which decreased the length of Segment F and increased the length of Segment M (Figure 3-9).

The central portion of Segment E was modified by shifting it to the west to avoid the new AEP Texas Lynx Switch Station and the northern portion was modified to provide a perpendicular crossing of FM 11 (Figure 3-10).

Based on input from University Lands, the central portion of Segment C1 was modified by shifting it to the northwest to avoid the Amazing Maze Cave (Figure 3-11).

Based on input from University Lands, the northern portion of Segment J1 was modified by shifting it to the east to better parallel a property line (Figure 3-12).

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Legend

- | | |
|--|--|
| Revised or New Alternative Route Segment | Communication Tower |
| Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting | Canal or Ditch |
| Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting | 138-kV Transmission Line |
| Revised or New Alternative Route Segment Node | Farm-to-Market Road |
| Unchanged Alternative Route Segment Node Shown at Open House Meeting | Local / County Road |
| Preliminary Alternative Route Segment Node Shown at Open House Meeting | Pipeline (Greater than or equal to 6 in. diameter or unknown size) |
| Resulting Alternative Route Segment Label | 10 ft Contour Line |
| Preliminary Alternative Route Segment Label Shown at Open House Meeting | |
| Parcel Group | |

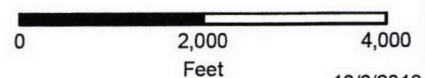
Bakersfield to Solstice 345-kV Transmission Line Project

Figure 3-2

Addition of Y2; Relabel of Western Portion of O as X2 and Z2 Following the Open House Meeting



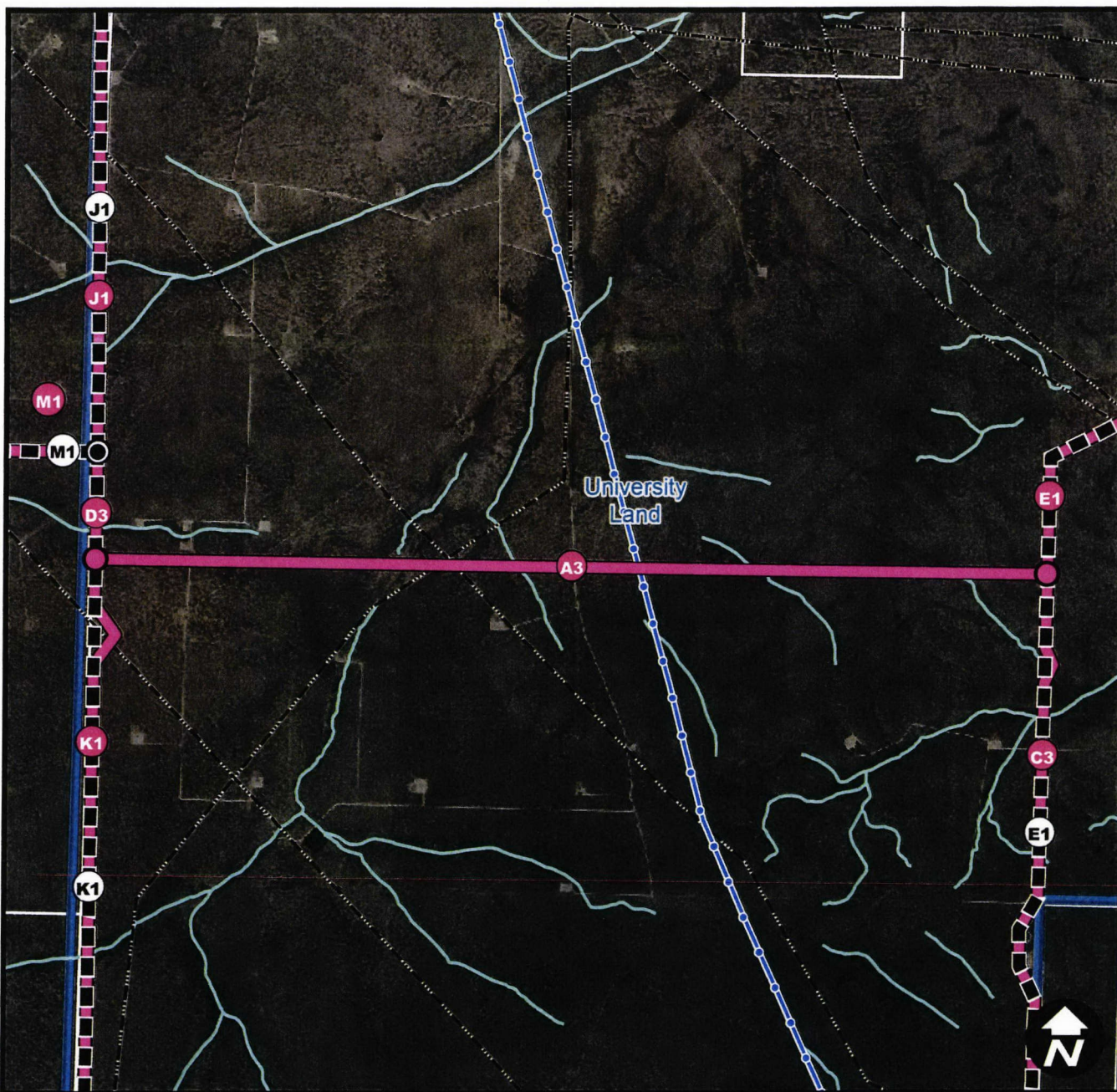
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- Revised or New Alternative Route Segment
- Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A Resulting Alternative Route Segment Label
- A Preliminary Alternative Route Segment Label Shown at Open House Meeting

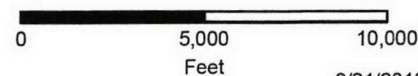
Parcel Group

- River or Stream
- University Land
- 138-kV Transmission Line
- Pipeline (Greater than or equal to 6 in. diameter or unknown size)

Bakersfield to Solstice 345-kV Transmission Line Project

Figure 3-3

**Addition of A3; Relabel of
Southern Portion of E1 as C3 and
the Northern Portion of K1 as D3
Following the Open House
Meeting**



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- Revised or New Alternative Route Segment
- Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A Resulting Alternative Route Segment Label
- A Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Parcel Group

- 138-kV Transmission Line
- Local / County Road
- Pipeline (Greater than or equal to 6 in. diameter or unknown size)
- New Oil & Gas Development

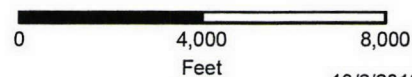
Bakersfield to Solstice 345-kV Transmission Line Project

Figure 3-4

Realignment of T Following the Open House Meeting



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Legend

- Revised or New Alternative Route Segment
- - - Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A Resulting Alternative Route Segment Label
- A Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Parcel Group



University Land

138-kV Transmission Line

Pipeline (Greater than or equal to 6 in. diameter or unknown size)

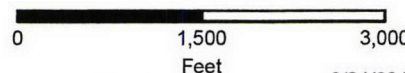
Bakersfield to Solstice 345-kV Transmission Line Project

Figure 3-5

Realignment of A1 Following the Open House Meeting



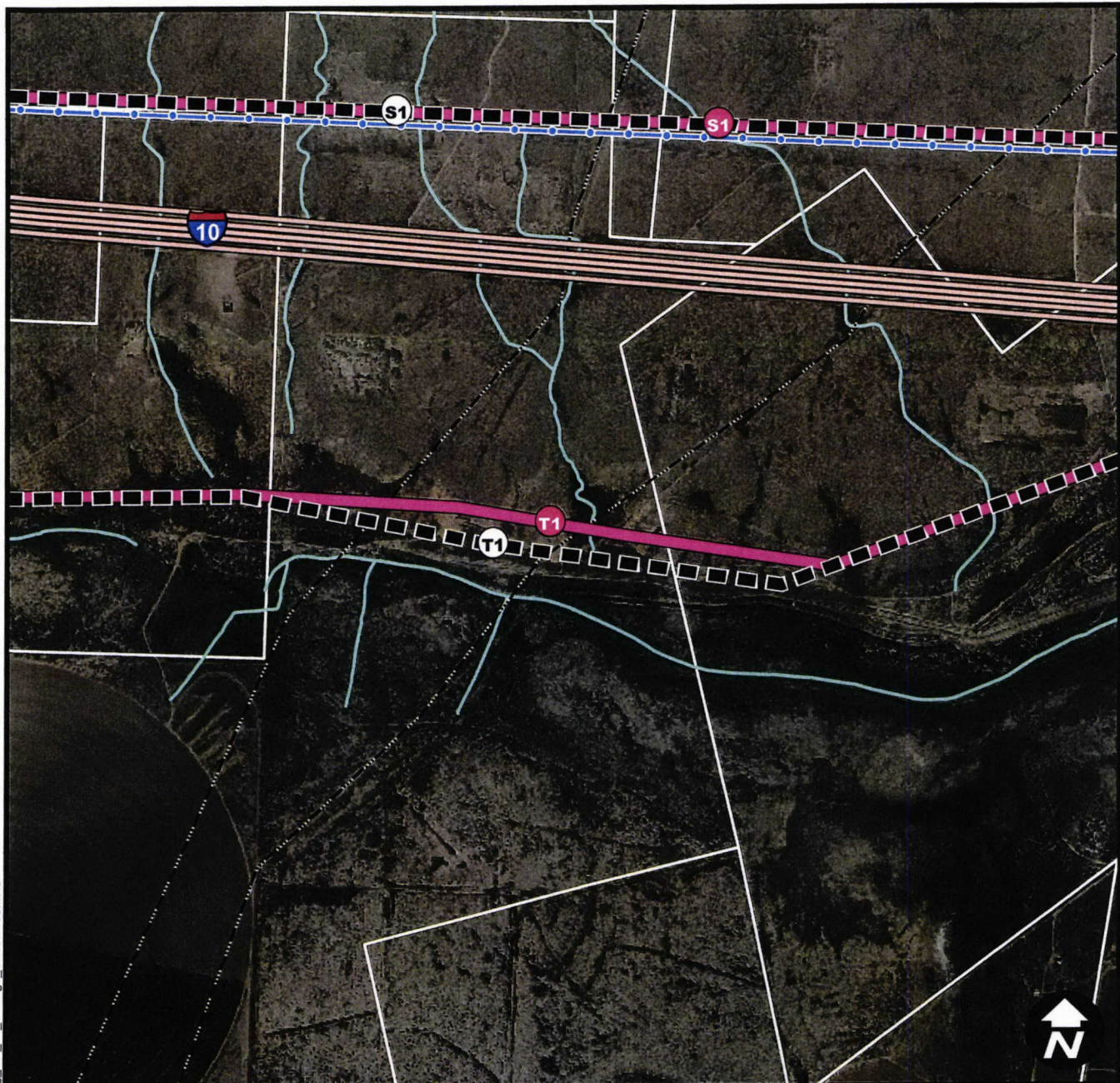
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- | | | | |
|--|--|--|--|
| | Revised or New Alternative Route Segment | | River or Stream |
| | Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting | | 138-kV Transmission Line |
| | Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting | | Interstate Highway |
| | Revised or New Alternative Route Segment Node | | Pipeline (Greater than or equal to 6 in. diameter or unknown size) |
| | Unchanged Alternative Route Segment Node Shown at Open House Meeting | | |
| | Preliminary Alternative Route Segment Node Shown at Open House Meeting | | |
| | Resulting Alternative Route Segment Label | | |
| | Preliminary Alternative Route Segment Label Shown at Open House Meeting | | |
| | Parcel Group | | |

**Bakersfield to Solstice
345-kV Transmission Line Project**

Figure 3-6

**Realignment of T1 Following the
Open House Meeting**



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0 1,500 3,000
Feet

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Legend

- | | |
|--|-----------------------------------|
| Revised or New Alternative Route Segment | Communication Tower |
| Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting | River or Stream |
| Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting | Canal or Ditch |
| Revised or New Alternative Route Segment Node | Bridgestone Texas Proving Grounds |
| Unchanged Alternative Route Segment Node Shown at Open House Meeting | 138-kV Transmission Line |
| Preliminary Alternative Route Segment Node Shown at Open House Meeting | Interstate Highway |
| Resulting Alternative Route Segment Label | US Highway |
| Preliminary Alternative Route Segment Label Shown at Open House Meeting | Farm-to-Market Road |
| Parcel Group | Local / County Road |

Bakersfield to Solstice 345-kV Transmission Line Project

Figure 3-7

Realignment of X1; Reduction of U and Extension of V; Relabel of Western Portion of W1 as B3 Following the Open House Meeting



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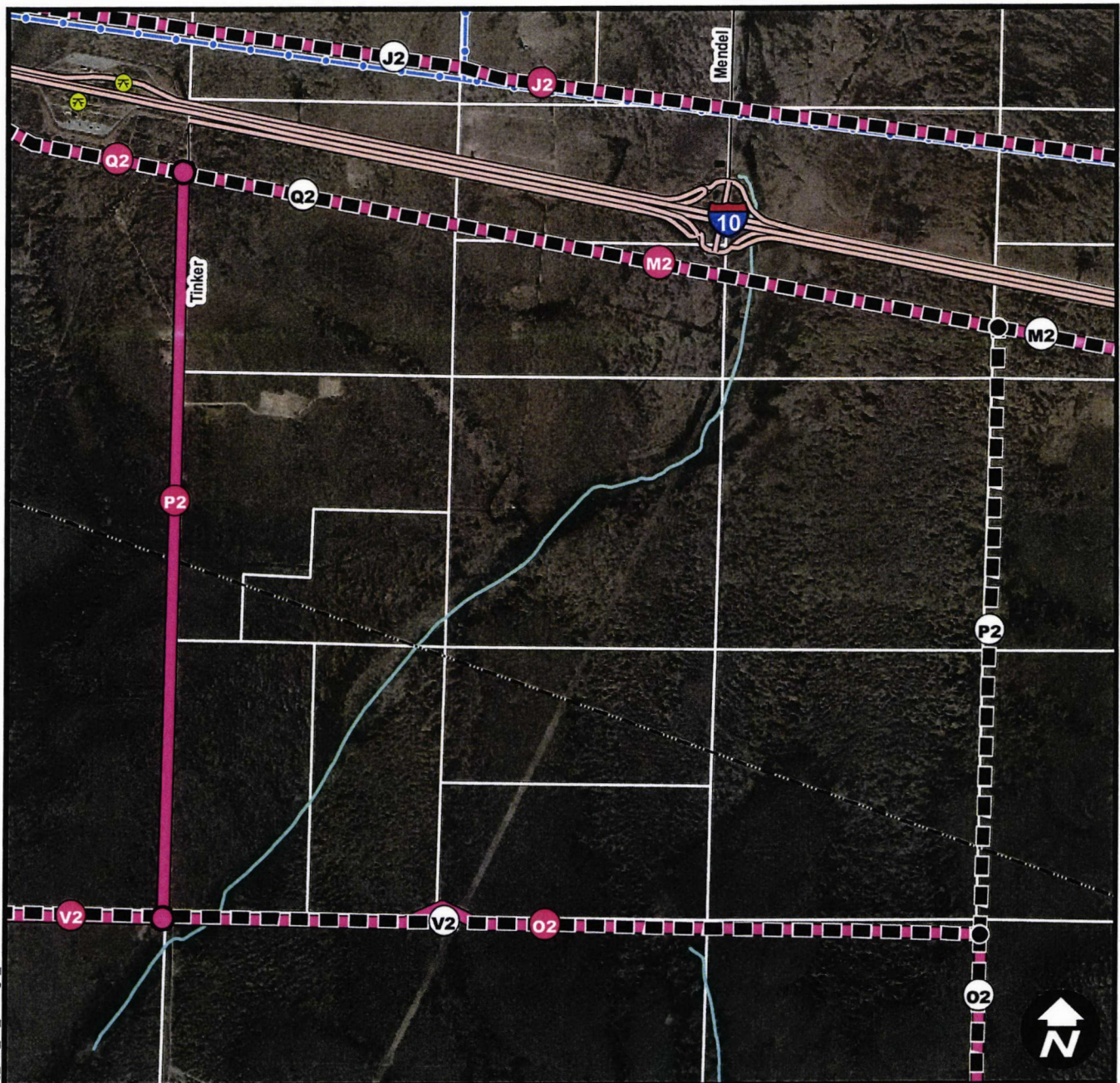


0 4,000 8,000
Feet

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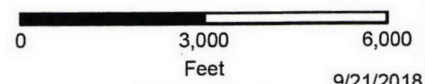
Legend

- | | |
|--|--|
| Revised or New Alternative Route Segment | Park or Recreation Area |
| Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting | River or Stream |
| Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting | 138-kV Transmission Line |
| Revised or New Alternative Route Segment Node | Interstate Highway |
| Unchanged Alternative Route Segment Node Shown at Open House Meeting | Local / County Road |
| Preliminary Alternative Route Segment Node Shown at Open House Meeting | Pipeline (Greater than or equal to 6 in. diameter or unknown size) |
| Resulting Alternative Route Segment Label | |
| Preliminary Alternative Route Segment Label Shown at Open House Meeting | |
| Parcel Group | |

Bakersfield to Solstice 345-kV Transmission Line Project

Figure 3-8

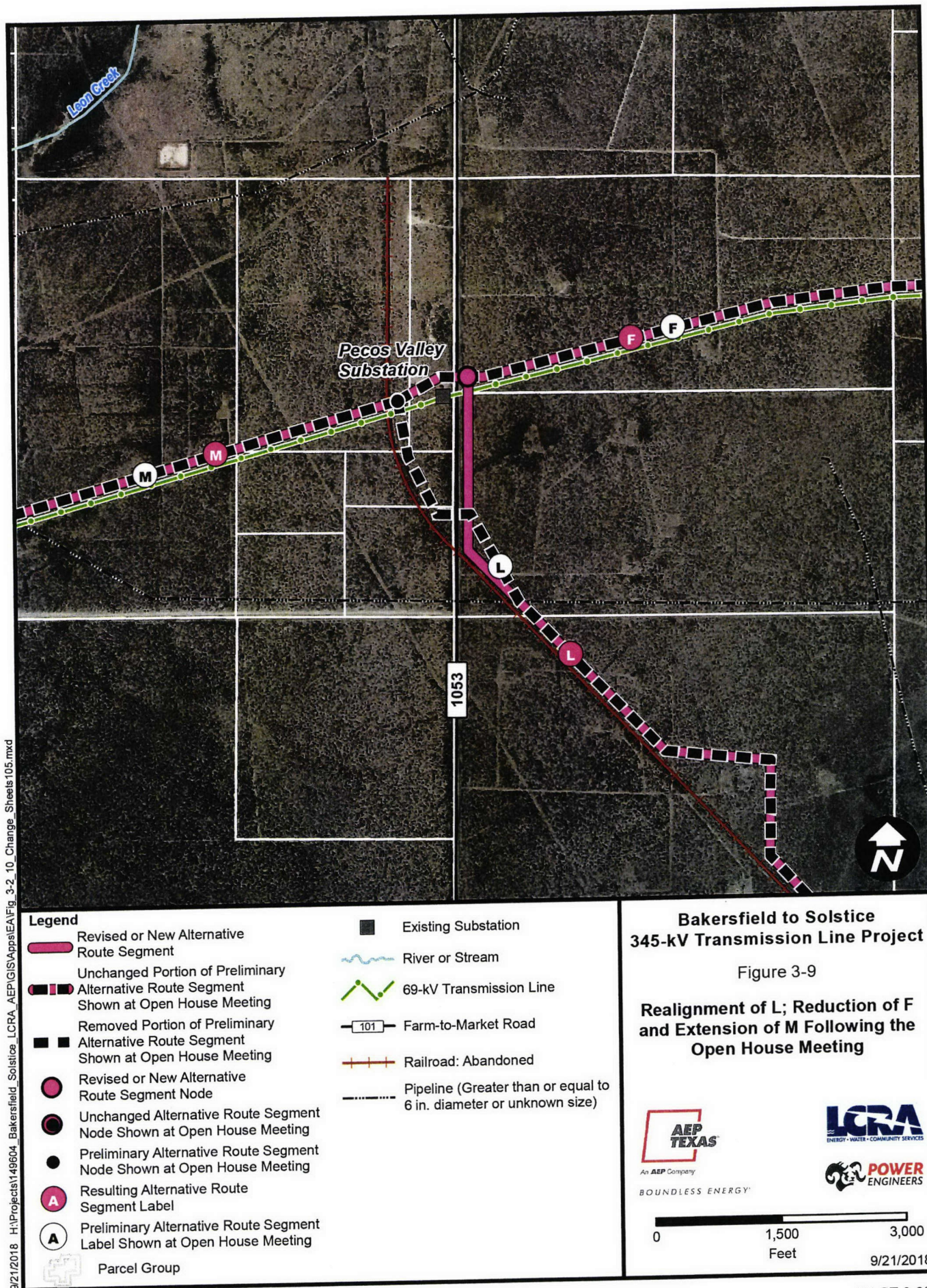
Realignment of P2; Reduction of Q2 and Extension of M2; Reduction of V2 and Extension of O2 Following the Open House Meeting



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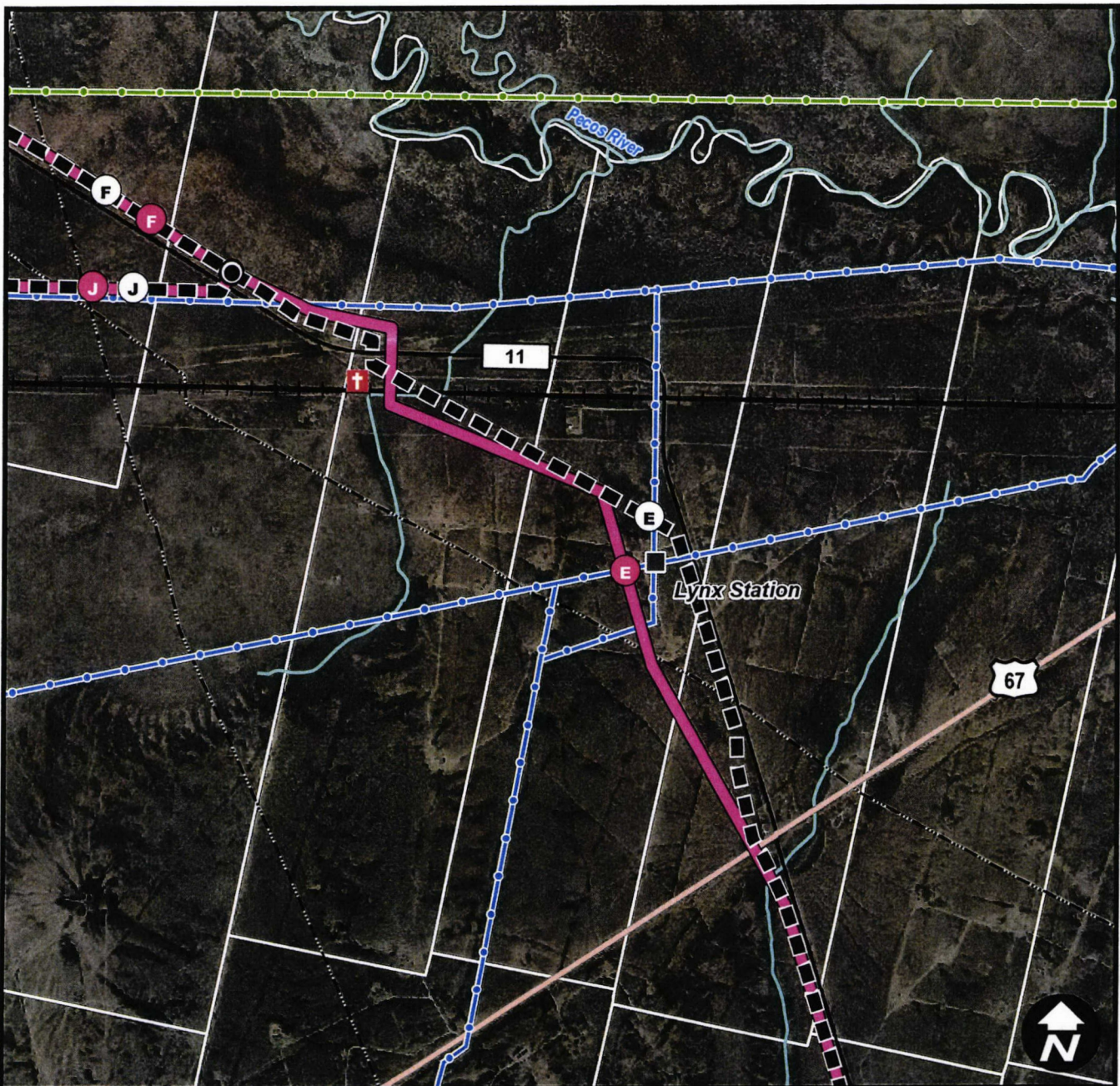
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Legend

- | | |
|--|--|
| Revised or New Alternative Route Segment | Cemetery |
| Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting | Lynx Station |
| Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting | River or Stream |
| Revised or New Alternative Route Segment Node | 138-kV Transmission Line |
| Unchanged Alternative Route Segment Node Shown at Open House Meeting | 69-kV Transmission Line |
| Preliminary Alternative Route Segment Node Shown at Open House Meeting | US Highway |
| Resulting Alternative Route Segment Label | Farm-to-Market Road |
| Preliminary Alternative Route Segment Label Shown at Open House Meeting | Railroad |
| Parcel Group | Pipeline (Greater than or equal to 6 in. diameter or unknown size) |

Bakersfield to Solstice 345-kV Transmission Line Project

Figure 3-10

Realignment of E Following the Open House Meeting



BOUNDLESS ENERGY™



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Feet

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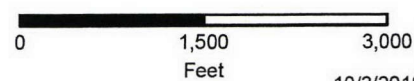
- Revised or New Alternative Route Segment
- - - Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- - - Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting
- Revised or New Alternative Route Segment Node
- Unchanged Alternative Route Segment Node Shown at Open House Meeting
- Preliminary Alternative Route Segment Node Shown at Open House Meeting
- A Resulting Alternative Route Segment Label
- A Preliminary Alternative Route Segment Label Shown at Open House Meeting
- Parcel Group

- ~~~~~ River or Stream
- University Land
- 10 Interstate Highway
- - - Pipeline (Greater than or equal to 6 in. diameter or unknown size)

Bakersfield to Solstice 345-kV Transmission Line Project

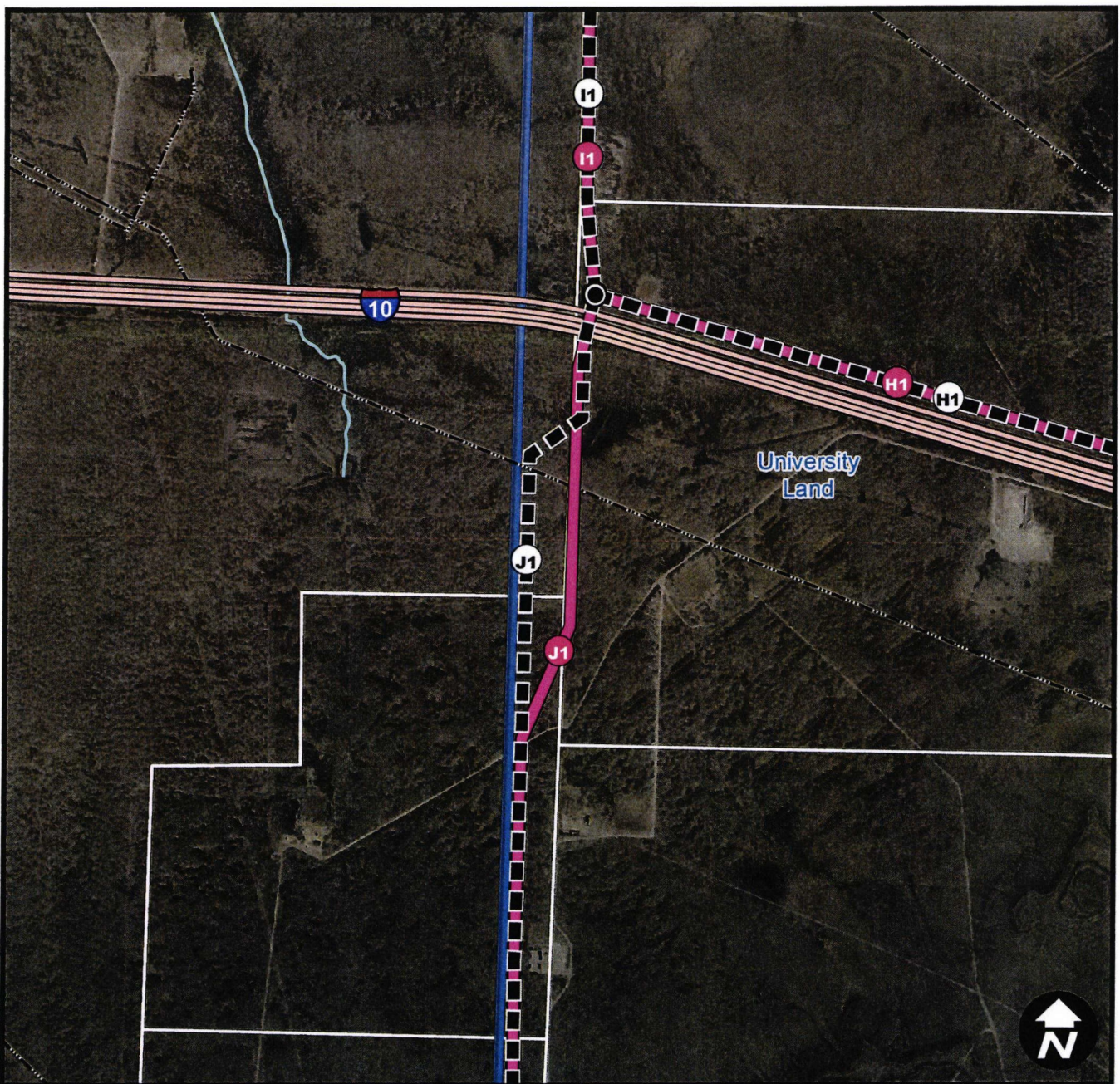
Figure 3-11

Realignment of C1 Following the Open House Meeting



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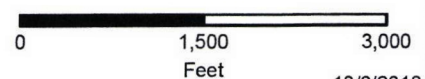
Legend

- | | | | |
|--|--|--|--|
| | Revised or New Alternative Route Segment | | River or Stream |
| | Unchanged Portion of Preliminary Alternative Route Segment Shown at Open House Meeting | | University Land |
| | Removed Portion of Preliminary Alternative Route Segment Shown at Open House Meeting | | Interstate Highway |
| | Revised or New Alternative Route Segment Node | | Pipeline (Greater than or equal to 6 in. diameter or unknown size) |
| | Unchanged Alternative Route Segment Node Shown at Open House Meeting | | |
| | Preliminary Alternative Route Segment Node Shown at Open House Meeting | | |
| | Resulting Alternative Route Segment Label | | |
| | Preliminary Alternative Route Segment Label Shown at Open House Meeting | | |
| | Parcel Group | | |

Bakersfield to Solstice 345-kV Transmission Line Project

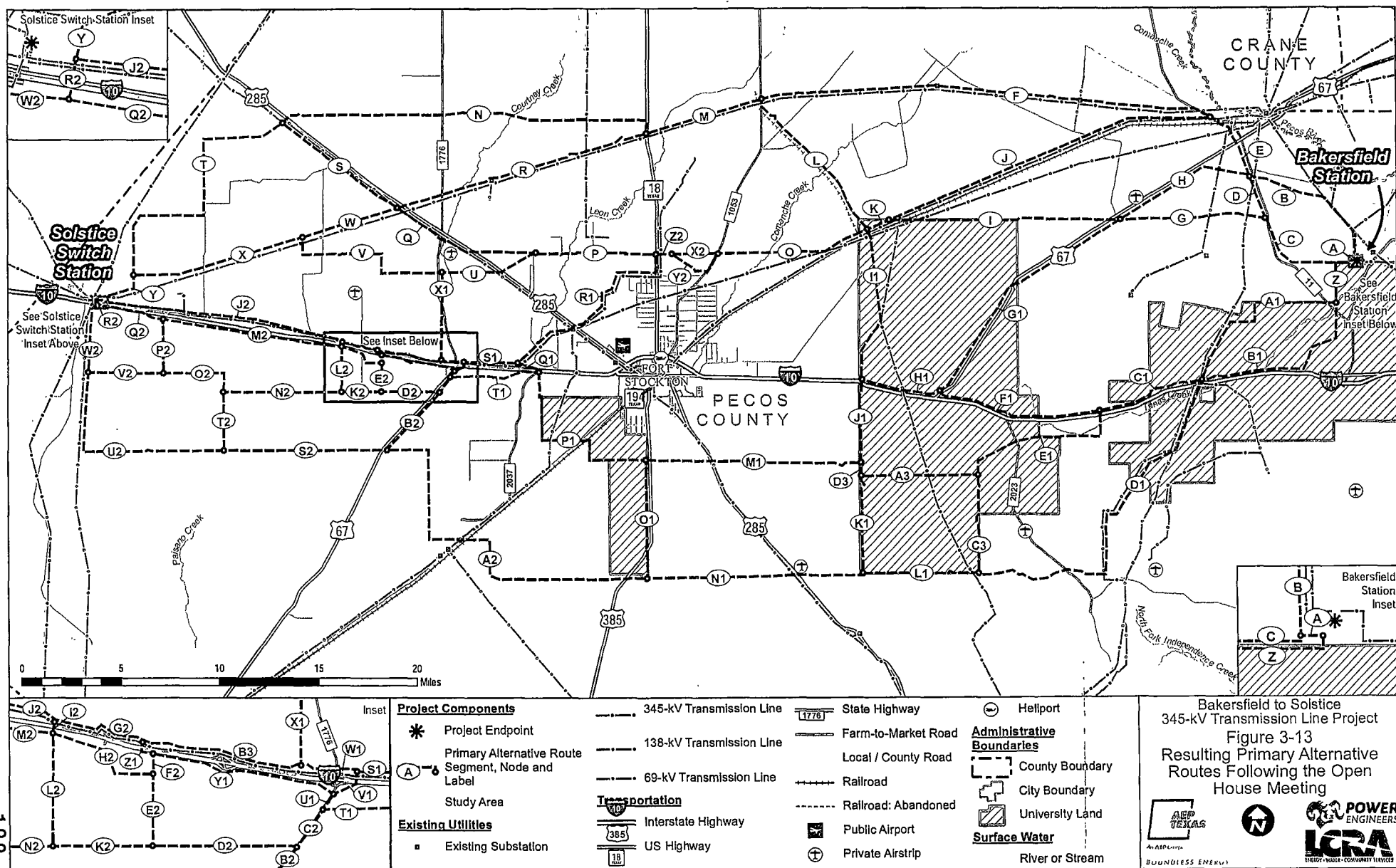
Figure 3-12

Realignment of J1 Following the Open House Meeting



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3.4 Primary Alternative Routes

It was the intent of POWER, LCRA TSC, and AEP Texas to identify alternative routing segments that, when combined, would form an adequate number of reasonable and geographically diverse primary alternative routes that reflect all of the previously discussed routing considerations.

Following the modifications to the 75 preliminary alternative route segments and identification of the new alternative route segments, 82 primary alternative route segments resulted. Numerous possible alternative routes using these 82 primary alternative route segments exist. POWER, LCRA TSC, and AEP Texas identified a total of 25 primary alternative routes for comparison that utilize all of the alternative route segments at least once and also provide geographic diversity. Many additional reasonable forward-progressing alternate routes may be formed by connecting the segments in various combinations. Table 3-2 details the route segment composition and overall length of the 25 primary alternative routes. See Figures 3-14a, b, and c in Appendix D for more detail on the location of the resulting routes. Potential impacts for each of the 46 evaluation criteria (see Table 2-1) were tabulated for each of the primary alternative routes (see Section 4.0).

TABLE 3-2 PRIMARY ALTERNATIVE ROUTES

PRIMARY ALTERNATIVE ROUTES	SEGMENT COMBINATION	TOTAL LENGTH IN MILES
1	A-B-E-F-M-R-W-X-Y	70.7
2	A-C-G-I-K-O-X2-Z2-P-Q-W-X-Y	67.8
3	A-C-G-I-K-O-X2-Z2-R1-S1-W1-B3-G2-J2	69.4
4	A-C-G-I-K-L-M-R-W-X-Y	71.1
5	A-B-E-J-K-O-X2-Z2-P-Q-W-X-Y	71.7
6	A-C-D-E-J-K-O-Y2-Z2-P-U-V-X-Y	74.2
7	A-B-E-J-K-O-Y2-Z2-P-U-X1-B3-G2-J2	75.7
8	A-B-E-F-M-N-T-Y	77.2
9	A-C-D-E-F-M-R-S-T-Y	78.9
10	Z-B1-C1-F1-H1-J1-M1-P1-Q1-S1-W1-B3-G2-J2	78.7
11	A-C-G-I-K-O-X2-Z2-P-Q-S-T-Y	75.6
12	A-B-H-G1-H1-J1-M1-P1-Q1-S1-W1-B3-G2-J2	80.3
13	Z-A1-C1-F1-H1-J1-M1-P1-T1-C2-D2-E2-F2-Z1-G2-J2	81.0
14	A-C-G-G1-H1-J1-M1-P1-T1-C2-D2-K2-L2-I2-J2	81.1
15	Z-B1-C1-F1-H1-J1-M1-P1-T1-C2-D2-K2-N2-O2-P2-Q2-R2	82.5
16	Z-A1-C1-F1-H1-J1-M1-P1-T1-C2-D2-K2-N2-O2-V2-W2-R2	84.1
17	Z-A1-C1-F1-H1-I1-O-X2-Z2-P-U-V-X-Y	81.4
18	Z-B1-D1-L1-N1-O1-P1-Q1-S1-V1-Y1-F2-H2-M2-Q2-R2	88.3
19	Z-A1-C1-F1-H1-J1-M1-P1-Q1-S1-V1-U1-C2-B2-S2-U2-W2-R2	89.3
20	Z-B1-C1-E1-C3-L1-N1-A2-S2-T2-O2-P2-Q2-R2	89.9
21	Z-A1-C1-E1-A3-K1-N1-A2-S2-U2-W2-R2	91.8
22	Z-A1-C1-E1-A3-D3-M1-P1-Q1-S1-W1-B3-G2-J2	77.0
23	A-B-E-J-K-O-X2-Z2-R1-S1-W1-B3-G2-J2	73.4
24	A-C-D-E-F-M-R-W-X-Y	71.1
25	Z-A1-C1-E1-A3-D3-M1-P1-T1-C2-D2-K2-N2-O2-V2-W2-R2	82.4

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4.0 ENVIRONMENTAL IMPACT OF THE PRIMARY ALTERNATIVE ROUTES

The evaluation and comparison of potential impacts for each primary alternative route (route or Route) is based upon the consideration of the requirements of § 37.056(c)(4) of the Texas Utilities Code, 16 TAC § 25.101(b)(3)(B), the PUC's CCN application form, and other requirements commonly included in the PUC's preliminary orders for transmission line CCN projects, as well as public comments from and following the open house meeting, field reconnaissance, and the information and responses received from local officials and state/federal regulatory agencies. Measurements for the majority of the environmental criteria were obtained from aerial photography flown in February 2018 and from available digital resource layers using GIS.

POWER professionals with expertise in different environmental disciplines (geology/soils, hydrology, terrestrial ecology, wetland ecology, land use/aesthetics, socioeconomics, cultural resources [archeological and historical]) and GIS evaluated the routes based upon environmental conditions present along each route (augmented by aerial photo interpretation and field reconnaissance) and the general routing criteria developed by LCRA TSC, AEP Texas, and POWER. Each POWER expert analyzed the routes and the environmental and land use data presented in Table 4-1 (Primary Alternative Route Data) and Table 4-2 (Primary Segment Data) for their technical discipline. A summary of potential impacts to environmental, community, and land use resources is provided in the following sections.

4.1 Natural Resources Impacts

4.1.1 Impacts on Geological Resources

Construction of the proposed transmission line is not anticipated to have any significant adverse effects on the physiographic or geologic features/resources of the area. Erection of the transmission structures will require excavation and minor disturbance of small quantities of near-surface materials, but should have no measurable impacts on the geologic resources or features along any of the primary alternative routes. Known cave and karst feature information was collected and mapped using GIS. Additional information on these known caves/karst features is provided in Section 2.2.1. These features were taken into consideration and avoided where known during the routing process.

Although karst features and formations may occur within this geologic region, no geologic hazards are anticipated to be created.

4.1.2 Impacts on Soils

Activities associated with the construction, operation, and maintenance of electrical transmission lines typically do not adversely impact soils when appropriate mitigative measures are implemented during the construction phase. Potential impacts to soils include erosion, compaction, and conversion of prime farmland soils.

The highest risk for soil erosion and compaction is primarily associated with the construction phase of a project. Prior to construction, LCRA TSC and AEP Texas will develop a SWPPP to minimize potential impacts associated with soil erosion and off ROW sedimentation. Implementation of this plan will incorporate BMPs, including erosion control devices to minimize soil erosion on the ROW during significant rainfall events. The SWPPP will also establish the criteria for revegetation to ensure adequate soil stabilization during the construction and post construction phases. The native herbaceous layer of vegetation will be maintained, to the extent practical, during construction and the most denuded areas with a low erosion potential will be allowed to revegetate naturally with native herbaceous species. Areas with a higher erosion potential, including steep slopes and areas with shallow topsoil, may require seeding and/or matting to stabilize disturbed areas and minimize soil erosion potential during the post construction phase. The ROW will be inspected during and after construction to ensure that potential high erosion areas are identified and appropriate BMPs are implemented and maintained.

The study area supports areas of cropland and pastureland, and some of the soil within the study area is designated by the USDA as "Prime Farmlands." As discussed in Section 2.0, the NRCS does not typically consider the construction of a transmission line to be a significant conversion of these soils. Agricultural activities are typically still practiced around the base of the structures after construction is completed. No significant conversions of prime farmland or state important soils are anticipated related to project activities for any of the primary alternative routes.

Table 4-1
Land Use and Environmental Data for Primary Route Evaluation
Routes 10/11/2018

Evaluation Criteria	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Land Use																
1 Length of primary alternative route (miles)	70.7	67.8	69.4	71.1	71.7	74.2	75.7	77.2	78.9	78.7	75.6	80.3	81.0	81.1	82.5	84.1
2 Number of habitable structures ¹ within 500 feet of ROW centerline	5	5	11	2	8	11	10	5	5	0	5	0	0	2	2	2
3 Length of ROW using existing transmission line ROW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4 Length of ROW parallel and adjacent to existing transmission line ROW	53.7	19.9	33.8	31.5	40.5	28.9	41.2	31.8	46.2	20.6	15.8	24.0	17.8	12.6	0.0	6.9
5 Length of ROW parallel and adjacent to existing 345-kV transmission line ROW	2.8	0.1	0.1	0.1	2.8	0.1	2.8	2.8	0.1	0.0	0.1	2.8	0.0	0.1	0.0	0.0
6 Length of ROW parallel and adjacent to existing 138-kV transmission line ROW ²	0.6	3.6	33.7	1.2	21.4	20.8	38.4	1.2	0.6	20.6	4.2	21.2	17.8	12.5	0.0	3.3
7 Length of ROW parallel and adjacent to existing 69-kV transmission line ROW	50.3	16.3	0.0	30.2	16.3	8.0	0.0	27.7	45.5	0.0	11.4	0.0	0.0	0.0	0.0	3.6
8 Length of ROW parallel and adjacent to other existing ROW (roadways, railways, etc.)	2.6	9.0	3.1	10.8	7.6	13.6	10.3	3.0	7.6	21.0	9.0	22.0	18.2	21.5	27.8	18.2
9 Length of ROW parallel and adjacent to apparent property lines ³	3.2	14.4	12.6	13.7	3.9	13.1	6.8	24.6	10.6	15.1	21.5	16.0	23.8	22.7	28.8	37.5
10 Sum of evaluation criteria 4, 8, and 9	59.4	43.4	49.5	56.0	52.0	55.7	58.3	59.4	64.4	56.7	46.3	62.0	59.8	56.8	57.6	62.6
11 Percent of evaluation criteria 4, 8, and 9	84%	64%	71%	79%	72%	75%	77%	77%	82%	72%	61%	77%	74%	70%	70%	74%
12 Length of ROW across parks/recreational areas ⁴	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13 Number of additional parks/recreational areas ⁵ within 1,000 feet of ROW centerline	0	0	1	0	0	0	1	0	0	3	0	3	3	3	3	2
14 Length of ROW across University Lands	0.0	8.2	8.2	8.4	1.7	1.7	1.7	0.0	0.0	38.4	8.2	23.8	38.5	23.8	38.4	38.5
15 Length of ROW through cropland	1.6	0.5	0.0	0.5	0.5	0.0	0.0	1.0	1.0	0.0	0.0	0.0	0.1	0.1	0.1	0.1
16 Length of ROW through pasture/rangeland	68.1	66.3	67.6	69.9	70.1	73.6	75.0	75.7	77.4	74.7	75.2	77.2	74.2	75.1	75.6	77.2
17 Length of ROW through land irrigated by traveling systems (rolling or pivot type)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18 Length of ROW parallel and adjacent to existing natural gas pipelines (6" diameter or greater) ⁶	1.8	0.0	0.0	1.8	0.0	0.0	0.0	1.5	2.1	0.6	0.3	0.6	3.6	0.4	0.4	3.6
19 Number of pipeline crossings ⁷	33	42	33	36	41	40	39	29	38	23	46	20	23	23	25	25
20 Number of transmission line crossings	9	8	7	8	8	8	7	9	9	6	8	7	6	7	6	6
21 Number of IH, US, and state highway crossings	3	3	3	3	3	3	3	3	3	5	3	5	6	6	6	6
22 Number of FM road crossings	5	3	3	3	5	5	5	5	5	2	3	2	2	2	2	2
23 Number of cemeteries within 1,000 feet of the ROW centerline	1	0	0	0	1	1	1	1	1	0	0	0	0	0	0	0
24 Number of FAA registered public/military airports ⁸ with at least one runway more than 3,200 feet in length located within 20,000 feet of ROW centerline	0	0	1	0	0	0	0	0	0	1	0	1	0	0	0	0
25 Number of FAA registered public/military airports ⁸ having no runway more than 3,200 feet in length located within 10,000 feet of ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 Number of private airstrips within 10,000 feet of the ROW centerline	0	2	1	1	1	1	1	0	0	0	2	1	0	1	0	0
27 Number of heliports within 5,000 feet of the ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
28 Number of commercial AM radio transmitters within 10,000 feet of the ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
29 Number of FM radio transmitters, microwave towers, and other electronic installations within 2,000 feet of ROW centerline	3	2	2	2	3	0	3	1	1	3	1	3	2	1	2	1
Aesthetics																
30 Estimated length of ROW within foreground visual zone ⁹ of IH, US, and state highways	4.0	9.5	25.1	5.0	8.5	4.0	19.5	4.6	11.2	47.6	16.7	46.8	40.7	38.0	36.2	28.3
31 Estimated length of ROW within foreground visual zone ⁹ of FM roads	7.6	5.1	5.1	6.6	5.7	12.9	11.2	7.5	12.6	1.5	5.1	1.3	1.5	4.0	1.5	1.5
32 Estimated length of ROW within foreground visual zone ¹⁰ of parks/recreational areas ⁴	0.0	0.0	1.5	0.0	0.0	0.0	1.5	0.0	0.0	4.3	0.0	3.8	4.3	3.8	4.3	2.8
Ecology																
33 Length of ROW through upland woodlands/brushland	17.8	8.5	5.1	7.4	14.6	8.5	11.3	20.1	13.6	10.5	7.3	11.5	11.8	9.6	13.9	11.8
34 Length of ROW through bottomland/riparian woodlands	0.26	0.20	0.63	0.04	0.28	0.28	0.24	0.28	0.29	0.05	0.23	0.01	0.00	0.00	0.04	0.11
35 Length of ROW across NMI mapped wetlands	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02	0.02	0.02
36 Length of ROW across known habitat of federally listed endangered or threatened species	0.0	0.01	0.0	0.0	0.01	0.01	0.01	0.0	0.0	0.0	0.01	0.0	0.0	0.0	0.0	0.0
37 Length of ROW across open water (lakes, ponds)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38 Number of stream crossings	17	17	26	15	16	16	13	16	15	28	17	34	23	27	26	25
39 Number of river crossings	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
40 Length of ROW parallel (within 100 feet) to streams or rivers	0.4	0.0	0.9	0.0	0.0	0.0	0.4	0.4	0.4	0.0	0.0	0.0	0.1	0.0	0.3	0.3
41 Length of ROW across 100-year floodplain (No defined floodplains in the study area)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cultural Resources																
42 Number of recorded cultural resource sites crossed by ROW	2	0	1	2	0	0	0	1	2	3	0	1	3	0	2	3
43 Number of additional recorded cultural resource sites within 1,000 feet of ROW centerline	2	2	2	2	2	2	2	2	2	12	2	6	9	6	12	9
44 Number of NRHP listed properties crossed by ROW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
45 Number of additional NRHP listed properties within 1,000 feet of ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
46 Length of ROW through areas of high archeological site potential	16.1	16.2	18.7	16.6	16.8	15.0	18.7	14.7	16.2	25.3	17.1	24.2	24.3	24.0	25.3	23.3

- Notes
- ¹Single-family and multi-family dwellings, and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, business structures, churches, hospitals, nursing homes, schools, or other structures normally inhabited by humans or extended to be inhabited by humans on a daily or regular basis within 500 feet of the centerline of a transmission project of 230 kV or more.
- ²The data associated with paralleling 138-kV transmission lines includes an existing 69-kV transmission line that is being upgraded for operation at 138 kV prior to the completion of the Proposed Project.
- ³Apparent property lines created by existing roads, highways or railroad ROWs are not "double-counted" in the length of ROW parallel to apparent property boundaries criteria.
- ⁴Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church within 1,000 feet of the centerline of the project.
- ⁵Only pipelines six inches and greater in diameter carrying petrochemicals were quantified in the pipeline crossing and paralleling calculations.
- ⁶As listed in the Chart Supplement South Central U.S. (FAA 2018b) formerly known as the Airport/Facility Directory South Central U.S.] and FAA 2018a.
- ⁷One half mile, unobstructed. Lengths of ROW within the visual foreground zone of Interstates, US and state highway criteria are not "double-counted" in the length of ROW within the visual foreground zone of FM roads criteria.
- ⁸One half mile, unobstructed. Lengths of ROW within the visual foreground zone of parks/recreational areas may overlap with the total length of ROW within the visual foreground zone of Interstates, US and state highway criteria and/or with the total length of ROW within the visual foreground zone of FM roads criteria.
- All length measurements are shown in miles unless noted otherwise. All linear measurements were obtained from aerial photography flown March 2018 with the exception of high probability areas for archeological/historic resources which were measured from the USGS Topographic Quadrangles. The aerial photography was orthorectified to National Map Accuracy Standards of +/- 9 feet.

Table 4-1
Land Use and Environmental Data for Primary Route Evaluation
Routes 10/11/2018

Evaluation Criteria									
Land Use	17	18	19	20	21	22	23	24	25
1 Length of primary alternative route (miles)	81.4	88.3	88.3	89.9	91.8	77.0	73.4	71.1	82.4
2 Number of habitable structures ¹ within 500 feet of ROW centerline	8	0	0	0	0	0	14	5	2
3 Length of ROW using existing transmission line ROW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4 Length of ROW parallel and adjacent to existing transmission line ROW	13.6	14.7	13.6	0.0	10.9	23.9	54.4	50.4	6.9
5 Length of ROW parallel and adjacent to existing 345-kV transmission line ROW	0.0	0.0	0.0	0.0	0.0	0.0	2.8	0.1	0.0
6 Length of ROW parallel and adjacent to existing 138-kV transmission line ROW ²	5.7	14.7	6.0	0.0	3.3	23.9	51.6	0.0	3.3
7 Length of ROW parallel and adjacent to existing 69-kV transmission line ROW	8.0	0.0	7.6	0.0	7.6	0.0	0.0	50.3	3.6
8 Length of ROW parallel and adjacent to other existing ROW (roadways, railways, etc.)	22.2	15.0	21.8	13.6	4.1	3.8	1.7	7.6	5.8
9 Length of ROW parallel and adjacent to apparent property lines ³	19.2	20.4	31.1	43.7	43.7	19.8	2.0	3.6	38.3
10 Sum of evaluation criteria 4, 8, and 9	55.0	50.1	66.5	57.3	58.7	47.4	58.1	61.5	51.0
11 Percent of evaluation criteria 4, 8, and 9	68%	57%	74%	64%	64%	62%	79%	86%	62%
12 Length of ROW across parks/recreational areas ⁴	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
13 Number of additional parks/recreational areas ⁴ within 1,000 feet of ROW centerline	2	1	2	1	0	1	1	0	0
14 Length of ROW across University Lands	34.1	39.6	38.5	32.3	32.3	36.6	1.7	0.0	36.6
15 Length of ROW through cropland	0.0	0.5	0.0	0.0	0.0	0.0	0.0	1.6	0.1
16 Length of ROW through pasture/rangeland	80.1	84.7	84.2	82.9	82.2	66.7	71.3	68.5	69.0
17 Length of ROW through land irrigated by traveling systems (rolling or pivot type)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
18 Length of ROW parallel and adjacent to existing natural gas pipelines (6" diameter or greater) ⁵	3.1	3.6	3.7	0.1	4.5	3.7	0.0	1.8	3.6
19 Number of pipeline crossings ⁵	44	22	25	23	23	24	32	34	26
20 Number of transmission line crossings	8	10	8	6	6	6	7	9	6
21 Number of IH, US, and state highway crossings	3	7	8	5	5	4	3	3	5
22 Number of FM road crossings	3	2	1	2	2	3	5	5	3
23 Number of cemeteries within 1,000 feet of the ROW centerline	0	0	0	0	0	0	1	1	0
24 Number of FAA registered public/military airports ⁶ with at least one runway more than 3,200 feet in length located within 20,000 feet of ROW centerline	0	1	1	0	0	1	1	0	0
25 Number of FAA registered public/military airports ⁶ having no runway more than 3,200 feet in length located within 10,000 feet of ROW centerline	0	0	0	0	0	0	0	0	0
26 Number of private airstrips within 10,000 feet of the ROW centerline	1	1	0	1	1	0	0	0	0
27 Number of heliports within 5,000 feet of the ROW centerline	0	0	0	0	0	0	0	0	0
28 Number of commercial AM radio transmitters within 10,000 feet of the ROW centerline	0	0	0	0	0	0	0	0	0
29 Number of FM radio transmitters, microwave towers, and other electronic installations within 2,000 feet of ROW centerline	1	2	1	1	0	2	3	2	0
Aesthetics									
30 Estimated length of ROW within foreground visual zone ⁷ of IH, US, and state highways	22.0	37.5	33.2	19.4	11.5	30.1	24.2	4.0	15.8
31 Estimated length of ROW within foreground visual zone ⁸ of FM roads	3.6	3.2	1.5	2.4	2.5	5.7	12.6	2.5	
32 Estimated length of ROW within foreground visual zone ^{9,10} of parks/recreational areas ⁴	2.8	1.6	2.8	1.5	0.0	1.5	1.5	0.0	0.0
Ecology									
33 Length of ROW through upland woodlands/brushland	9.2	10.2	10.3	13.1	13.6	13.3	11.1	14.8	16.2
34 Length of ROW through bottomland/riparian woodlands	0.20	0.11	0.26	0.53	0.85	0.06	0.71	0.26	0.17
35 Length of ROW across NWD mapped wetlands	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.02
36 Length of ROW across known habitat of federally listed endangered or threatened species	0.01	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
37 Length of ROW across open water (lakes, ponds)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
38 Number of stream crossings	20	36	29	23	23	24	25	15	23
39 Number of river crossings	0	0	0	0	0	0	0	0	0
40 Length of ROW parallel (within 100 feet) to streams or rivers	0.1	0.5	0.2	0.4	0.5	0.0	0.9	0.4	0.2
41 Length of ROW across 100-year floodplain (No defined floodplains in the study area)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cultural Resources									
42 Number of recorded cultural resource sites crossed by ROW	4	4	3	3	4	5	1	2	4
43 Number of additional recorded cultural resource sites within 1,000 feet of ROW centerline	9	10	9	11	4	3	2	2	3
44 Number of NRHP listed properties crossed by ROW	0	0	0	0	0	0	0	0	0
45 Number of additional NRHP listed properties within 1,000 feet of ROW centerline	0	0	0	0	0	0	0	0	0
46 Length of ROW through areas of high archeological site potential	21.4	31.3	24.1	31.5	27.0	27.2	19.3	15.3	27.5

Notes:
¹Single-family and multi-family dwellings, and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, business structures, churches, hospitals, nursing homes, schools, or other structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis within 500 feet of the centerline of a transmission project of 230-kV or more

²The data associated with paralleling 138-kV transmission lines includes an existing 69-kV transmission line that is being upgraded for operation at 138 kV prior to the completion of the Project.

³Apparent property lines, created by existing roads, highways, or railroad ROWs are not "double counted" in the length of ROW parallel to apparent property boundaries criteria.

⁴Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church within 1,000 feet of the centerline of the project.

⁵Only pipelines six inches and greater in diameter carrying petrochemicals were quantified in the pipeline crossing and paralleling calculations.

⁶As listed in the Chart Supplement South Central U.S. (FAA 2018b formerly known as the Airport/Facility Directory South Central U.S.) and FAA 2018a.

⁷One-half mile, unobstructed. Lengths of ROW within the visual foreground zone of interstates, US and state highway criteria are not "double counted" in the length of ROW within the visual foreground zone of FM roads criteria.

⁸One-half mile, unobstructed. Lengths of ROW within the visual foreground zone of parks/recreational areas may overlap with the total length of ROW within the visual foreground zone of interstates, US and state highway criteria and/or with the total length of ROW within the visual foreground zone of FM roads criteria.

All length measurements are shown in miles unless noted otherwise. All linear measurements were obtained from aerial photography from March 2018 with the exception of high probability areas for archeological/historical resources which were measured from the USGS Topographic Quadrangles. The aerial photography was orthorectified to National Map Accuracy Standards of +/- 9 feet.

Table 4-2
Land Use and Environmental Data for Primary Route Evaluation (Primary Segments)
Primary Alternative Segments 10/05/2018

Evaluation Criteria	A	A1	A2	A3	B	B1	B2	B3	C	C1	C2	C3	D	D1
1 Length of primary alternative segment (miles)	0.1	9.6	19.6	5.9	7.7	9.5	4.0	3.3	5.9	5.5	0.9	5.1	2.2	18.8
2 Number of habitable structures ¹ within 500 feet of ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3 Length of ROW using existing transmission line ROW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4 Length of ROW parallel and adjacent to existing transmission line ROW	0.1	3.3	0.0	0.0	3.3	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	12.0
5 Length of ROW parallel and adjacent to existing 345-kV transmission line ROW	0.1	0.0	0.0	0.0	2.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 Length of ROW parallel and adjacent to existing 138-kV transmission line ROW ²	0.0	3.3	0.0	0.0	0.6	0.0	0.0	2.5	0.0	0.0	0.0	0.0	0.0	12.0
7 Length of ROW parallel and adjacent to existing 69-kV transmission line ROW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8 Length of ROW parallel and adjacent to other existing ROW (roadways, railways, etc.)	0.0	0.0	0.0	0.0	0.0	4.7	4.0	0.0	2.7	3.8	0.9	0.0	2.2	0.0
9 Length of ROW parallel and adjacent to apparent property lines ³	0.0	3.9	14.9	0.0	2.0	0.0	0.0	0.0	2.4	0.0	0.0	2.4	0.0	1.7
10 Length of ROW across parks/recreational areas ⁴	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11 Number of additional parks/recreational areas ⁴ within 1,000 feet of ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12 Length of ROW across University Lands	0.0	9.6	0.0	5.9	0.0	9.5	0.0	0.0	0.0	3.7	0.0	5.1	0.0	6.6
13 Length of ROW through cropland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14 Length of ROW through pasture/rangeland	0.1	9.6	18.8	4.2	7.7	9.5	4.0	3.3	5.9	4.8	0.9	5.0	2.2	18.7
15 Length of ROW through land irrigated by traveling systems (rolling or pivot type)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16 Length of ROW parallel and adjacent to existing natural gas pipelines (steel and 6" diameter or greater) ⁵	0.0	3.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.0
17 Number of pipeline crossings ⁵	0	3	4	3	4	3	1	0	5	5	0	1	0	9
18 Number of transmission line crossings	0	0	1	1	1	0	0	0	0	1	0	0	1	3
19 Number of IH, US, and state highway crossings	0	0	1	0	0	0	0	0	0	0	0	0	0	1
20 Number of FM road crossings	0	1	0	0	1	1	0	0	1	0	0	0	0	1
21 Number of cemeteries within 1,000 feet of the ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22 Number of FAA registered public/military airports ⁶ with at least one runway more than 3,200 feet in length located within 20,000 feet of ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23 Number of FAA registered public/military airports ⁶ having no runway more than 3,200 feet in length located within 10,000 feet of ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24 Number of private airstrips within 10,000 feet of the ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
25 Number of heliports within 5,000 feet of the ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 Number of commercial AM radio transmitters within 10,000 feet of the ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27 Number of FM radio transmitters, microwave towers, and other electronic installations within 2,000 feet of ROW centerline	0	0	0	0	1	0	0	1	0	0	0	0	0	0
Aesthetics														
28 Estimated length of ROW within foreground visual zone ⁷ of IH, US, and state highways	0.0	0.5	2.0	0.0	0.0	5.6	4.0	3.3	0.0	5.5	0.9	0.0	0.0	0.7
29 Estimated length of ROW within foreground visual zone ⁷ of FM roads	0.0	1.1	0.0	0.0	0.6	1.1	0.0	0.0	3.4	0.0	0.0	0.0	2.2	1.6
30 Estimated length of ROW within foreground visual zone ⁸ of parks/recreational areas ⁴	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Ecology														
31 Length of ROW through upland woodlands/brushland	0.0	1.1	1.8	1.7	4.4	2.7	0.0	0.0	1.4	1.3	0.0	0.1	0.0	2.7
32 Length of ROW through bottomland/riparian woodlands	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33 Length of ROW across NWI mapped wetlands	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34 Length of ROW across known habitat of federally listed endangered or threatened species	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35 Length of ROW across open water (lakes, ponds)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36 Number of stream crossings	0	0	6	3	2	2	0	0	2	0	3	0	0	14
37 Number of river crossings	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38 Length of ROW parallel (within 100 feet) to streams or rivers	0.0	0.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3
39 Length of ROW across 100-year floodplain	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cultural Resources														
40 Number of recorded cultural resource sites crossed by ROW	0	2	0	0	0	1	0	0	0	0	0	1	0	3
41 Number of additional recorded cultural resource sites within 1,000 feet of ROW centerline	2	1	0	1	2	5	0	0	2	0	0	3	0	2
42 Number of NRHP listed properties crossed by ROW	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43 Number of additional NRHP listed properties within 1,000 feet of ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44 Length of ROW through areas of high archaeological site potential	0.1	2.4	5.3	3.9	3.6	4.7	2.6	1.1	1.6	1.3	0.6	3.6	1.1	10.8

Notes: ¹Single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, business structures, churches, hospitals, nursing homes, schools, or other structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis within 500 feet of the centerline of a transmission project of 230 kV or more.

²The data associated with paralleling 138 kV transmission lines includes an existing 69-kV transmission line that is being upgraded for operation at 138 kV prior to the completion of the Proposed Project.

³Apparent property lines created by existing roads, highways, or railroad ROWs are not "double-counted" in the length of ROW parallel to apparent property boundaries criteria.

⁴Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church within 1,000 feet of the centerline of the project.

⁵Only pipelines six inches and greater in diameter carrying petrochemicals were quantified in the pipeline crossing and paralleling calculations.

⁶As listed in the Chart Supplement South Central U.S. (FAA 2018b) formerly known as the Airport/Facility Directory South Central U.S.) and FAA 2018a.

⁷One-half mile, unobstructed. Lengths of ROW within the visual foreground zone of interstates, US and state highway criteria are not "double-counted" in the length of ROW within the visual foreground zone of FM roads criteria.

⁸One-half mile, unobstructed. Lengths of ROW within the visual foreground zone of parks/recreational areas may overlap with the total length of ROW within the visual foreground zone of interstates, US and state highway criteria and/or with the total length of ROW within the visual foreground zone of FM roads criteria.

All length measurements are shown in miles unless noted otherwise. All linear measurements were obtained from aerial photography flown March, 2018 with the exception of high probability areas for archeological/historical resources which were measured from the USGS Topographic Quadrangles. The aerial photography was orthorectified to National Map Accuracy Standards of +/- 9 feet.

Table 4-2
Land Use and Environmental Data for Primary Route Evaluation (Primary Segments)
Primary Alternative Segments 10/05/2018

Evaluation Criteria	D2	D3	E	E1	E2	F	F1	F2	G	G1	G2	H	H1	H2
1 Length of primary alternative segment (miles)	2.9	0.7	3.9	8.5	1.5	22.9	8.4	0.4	7.3	13.0	1.9	7.3	4.1	2.4
2 Number of habitable structures ¹ within 500 feet of ROW centerline	0	0	3	0	0	0	0	0	0	0	0	0	0	0
3 Length of ROW using existing transmission line ROW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4 Length of ROW parallel and adjacent to existing transmission line ROW	0.0	0.0	0.0	0.0	0.0	20.1	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0
5 Length of ROW parallel and adjacent to existing 345-kV transmission line ROW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 Length of ROW parallel and adjacent to existing 138-kV transmission line ROW ²	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.9	0.0	0.0	0.0
7 Length of ROW parallel and adjacent to existing 69-kV transmission line ROW	0.0	0.0	0.0	0.0	0.0	20.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
8 Length of ROW parallel and adjacent to other existing ROW (roadways, railways, etc.)	0.0	0.0	1.6	0.0	0.0	1.0	8.4	0.0	0.0	13.0	0.0	4.9	4.1	0.0
9 Length of ROW parallel and adjacent to apparent property lines ³	2.9	0.7	0.0	4.2	1.5	0.0	0.0	0.4	0.9	0.0	0.0	1.9	0.0	0.0
10 Length of ROW across parks/recreational areas ⁴	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11 Number of additional parks/recreational areas ⁴ within 1,000 feet of ROW centerline	0	0	0	0	0	0	2	0	0	2	0	0	1	0
12 Length of ROW across University Lands	0.0	0.7	0.0	5.1	0.0	0.0	5.2	0.0	0.0	6.9	0.0	0.0	4.1	0.0
13 Length of ROW through cropland	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.5
14 Length of ROW through pasture/rangeland	2.9	0.6	3.8	3.5	1.5	21.7	8.2	0.4	7.3	12.9	1.9	7.3	4.1	1.9
15 Length of ROW through land irrigated by traveling systems (rolling or pivot type)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16 Length of ROW parallel and adjacent to existing natural gas pipelines (steel and 6" diameter or greater) ⁵	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
17 Number of pipeline crossings ⁵	0	0	1	3	0	6	1	0	4	2	0	2	2	0
18 Number of transmission line crossings	0	0	3	0	0	2	0	0	2	0	0	1	1	0
19 Number of IH, US, and state highway crossings	1	0	1	1	0	0	1	0	0	1	0	0	0	0
20 Number of FM road crossings	0	0	1	1	0	1	0	0	0	0	0	0	0	0
21 Number of cemeteries within 1,000 feet of the ROW centerline	0	0	1	0	0	0	0	0	0	0	0	0	0	0
22 Number of FAA registered public/military airports ⁶ with at least one runway more than 3,200 feet in length located within 20,000 feet of ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23 Number of FAA registered public/military airports ⁶ having no runway more than 3,200 feet in length located within 10,000 feet of ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24 Number of private airstrips within 10,000 feet of the ROW centerline	0	0	0	0	0	0	0	0	1	1	0	1	0	0
25 Number of heliports within 5,000 feet of the ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 Number of commercial AM radio transmitters within 10,000 feet of the ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27 Number of FM radio transmitters, microwave towers, and other electronic installations within 2,000 feet of ROW centerline	0	0	0	0	0	0	1	0	0	0	0	0	0	0
Aesthetics														
28 Estimated length of ROW within foreground visual zone ⁷ of IH, US, and state highways	0.6	0.0	1.0	0.6	0.1	0.0	8.4	0.4	0.9	13.0	1.9	5.6	4.1	1.8
29 Estimated length of ROW within foreground visual zone ⁷ of FM roads	0.0	0.0	2.9	1.0	0.0	2.5	0.0	0.0	0.5	0.0	0.0	0.6	0.0	0.0
30 Estimated length of ROW within foreground visual zone ^{7(M)} of parks/recreational areas ⁴	0.0	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	1.5	0.0	0.0	0.8	0.0
Ecology														
31 Length of ROW through upland woodlands/brushland	0.0	0.0	0.3	4.8	0.0	8.3	1.1	0.0	0.0	1.3	0.0	1.7	0.8	0.0
32 Length of ROW through bottomland/riparian woodlands	0.0	0.0	0.0	0.1	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
33 Length of ROW across NWI mapped wetlands	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34 Length of ROW across known habitat of federally listed endangered or threatened species	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35 Length of ROW across open water (lakes, ponds)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36 Number of stream crossings	0	1	2	2	0	7	6	0	7	5	0	9	0	0
37 Number of river crossings	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38 Length of ROW parallel (within 100 feet) to streams or rivers	0.0	0.0	0.0	0.0	0.0	0.4	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39 Length of ROW across 100-year floodplain	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cultural Resources														
40 Number of recorded cultural resource sites crossed by ROW	0	0	0	1	0	0	0	0	0	0	0	0	0	0
41 Number of additional recorded cultural resource sites within 1,000 feet of ROW centerline	0	0	0	0	0	0	4	0	0	1	0	0	0	0
42 Number of NRHP listed properties crossed by ROW	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43 Number of additional NRHP listed properties within 1,000 feet of ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44 Length of ROW through areas of high archaeological site potential	0.6	0.4	1.5	5.8	0.0	3.9	4.0	0.3	3.5	4.5	0.0	2.7	0.0	0.2

Notes: ¹Single-family and multi-family dwellings and related structures: mobile homes, apartment buildings, commercial structures, industrial structures, business structures, churches, hospitals, nursing homes, schools, or other structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis within 500 feet of the centerline of a transmission project of 230 kV or more.

²The data associated with paralleling 138-kV transmission lines includes an existing 69-kV transmission line that is being upgraded for operation at 138-kV prior to the completion of the Proposed Project.

³Apparent property lines created by existing roads, highways, or railroad ROWs are not "double-counted" in the length of ROW parallel to apparent property boundaries criteria.

⁴Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church within 1,000 feet of the centerline of the project.

⁵Only pipelines six inches and greater in diameter carrying petrochemicals were quantified in the pipeline crossing and paralleling calculations.

⁶As listed in the Chart Supplement South Central U.S. (FAA 2018b) formerly known as the Airport/Facility Directory South Central U.S. and FAA 2018a.

⁷One-half mile, unobstructed. Lengths of ROW within the visual foreground zone of interstates, US and state highway criteria are not "double-counted" in the length of ROW within the visual foreground zone of FM roads criteria.

^{7(M)}One-half mile, unobstructed. Lengths of ROW within the visual foreground zone of parks/recreational areas may overlap with the total length of ROW within the visual foreground zone of interstates, US and state highway criteria and/or with the total length of ROW within the visual foreground zone of FM roads criteria.

All length measurements are shown in miles unless noted otherwise. All linear measurements were obtained from aerial photography flown March, 2014 with the exception of high probability areas for archaeological historic resources which were measured from the USGS Topographic Quadrangles. The aerial photography was orthorectified to National Map Accuracy Standards of +/- 9 feet.

Table 4-2
Land Use and Environmental Data for Primary Route Evaluation (Primary Segments)
Primary Alternative Segments 10/05/2018

Evaluation Criteria		Primary Alternative Segments 10/05/2018													
	Land Use	I	I1	I2	J	J1	J2	K	K1	K2	L	L1	L2	M	M1
1	Length of primary alternative segment (miles)	11.8	8.0	0.2	17.3	4.3	12.5	1.2	5.0	2.0	8.8	5.9	2.3	6.1	10.9
2	Number of habitable structures ¹ within 500 feet of ROW centerline	0	0	0	0	0	0	0	0	2	0	0	0	2	0
3	Length of ROW using existing transmission line ROW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4	Length of ROW parallel and adjacent to existing transmission line ROW	0.0	0.0	0.0	17.3	0.0	12.5	1.2	0.0	0.0	0.0	0.0	0.0	5.9	0.0
5	Length of ROW parallel and adjacent to existing 345-kV transmission line ROW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6	Length of ROW parallel and adjacent to existing 138 kV transmission line ROW ²	0.0	0.0	0.0	17.3	0.0	12.5	1.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7	Length of ROW parallel and adjacent to existing 69-kV transmission line ROW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.9	0.0
8	Length of ROW parallel and adjacent to other existing ROW (roadways, railways, etc.)	0.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	7.7	0.0	0.0	0.0	0.0
9	Length of ROW parallel and adjacent to apparent property lines ³	9.2	1.5	0.0	0.0	4.0	0.0	0.0	4.6	2.0	0.0	5.5	2.3	0.0	0.8
10	Length of ROW across parks/recreational areas ⁴	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11	Number of additional parks/recreational areas ⁴ within 1,000 feet of ROW centerline	0	0	0	0	0	1	0	0	0	0	0	0	0	0
12	Length of ROW across University Lands	6.5	8.0	0.0	0.1	4.3	0.0	1.2	5.0	0.0	0.6	5.9	0.0	0.0	0.1
13	Length of ROW through cropland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14	Length of ROW through pasture/rangeland	11.8	8.0	0.1	17.2	4.2	12.5	1.2	5.0	2.0	8.8	5.9	2.3	6.1	10.9
15	Length of ROW through land irrigated by traveling systems (rolling or pivot type)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16	Length of ROW parallel and adjacent to existing natural gas pipelines (steel and 6" diameter or greater) ⁵	0.0	0.0	0.0	0.0	0.0	0.0	0.0	1.2	0.0	0.0	0.0	0.0	1.2	0.0
17	Number of pipeline crossings ⁵	2	2	0	5	2	0	0	1	0	3	3	0	4	4
18	Number of transmission line crossings	2	2	1	0	0	1	0	0	0	1	1	0	0	1
19	Number of IH, US, and state highway crossings	1	0	1	0	1	0	0	0	0	0	0	0	1	2
20	Number of FM road crossings	0	0	0	1	0	0	0	0	0	0	0	0	1	0
21	Number of cemeteries within 1,000 feet of the ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22	Number of FAA registered public/military airports ⁶ with at least one runway more than 3,200 feet in length located within 20,000 feet of ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
23	Number of FAA registered public/military airports ⁶ having no runway more than 3,200 feet in length located within 10,000 feet of ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24	Number of private airstrips within 10,000 feet of the ROW centerline	1	0	0	0	0	0	0	0	0	0	0	0	0	0
25	Number of heliports within 5,000 feet of the ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26	Number of commercial AM radio transmitters within 10,000 feet of the ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27	Number of FM radio transmitters, microwave towers, and other electronic installations within 2,000 feet of ROW centerline	0	0	0	0	0	1	0	0	0	0	0	0	0	0
	Aesthetics														
28	Estimated length of ROW within foreground visual zone ⁷ of IH, US, and state highways	1.1	0.5	0.2	0.0	0.6	10.5	0.0	0.0	0.0	0.0	0.0	0.4	0.6	1.6
29	Estimated length of ROW within foreground visual zone ⁷ of FM roads	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.1	0.0	0.0	0.6	0.0
30	Estimated length of ROW within foreground visual zone ^{7/8} of parks/recreational areas ⁴	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Ecology														
31	Length of ROW through upland woodlands/brushland	0.8	0.3	0.0	3.6	0.2	0.2	0.0	0.0	0.0	0.3	0.3	0.0	0.8	0.2
32	Length of ROW through bottomland/riparian woodlands	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0
33	Length of ROW across NWI mapped wetlands	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34	Length of ROW across known habitat of federally listed endangered or threatened species	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35	Length of ROW across open water (lakes, ponds)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36	Number of stream crossings	0	0	0	2	2	2	0	2	0	2	2	0	1	5
37	Number of river crossings	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38	Length of ROW parallel (within 100 feet) to streams or rivers	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39	Length of ROW across 100-year floodplain	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Cultural Resources														
40	Number of recorded cultural resource sites crossed by ROW	0	1	0	0	0	0	0	0	0	0	0	0	1	0
41	Number of additional recorded cultural resource sites within 1,000 feet of ROW centerline	0	3	0	0	3	0	0	1	0	1	2	0	0	0
42	Number of NRHP listed properties crossed by ROW	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43	Number of additional NRHP listed properties within 1,000 feet of ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44	Length of ROW through areas of high archaeological site potential	1.2	3.6	0.0	1.9	2.0	3.9	0.0	0.9	0.0	3.1	1.9	0.0	0.9	2.1

Notes:

¹Single-family and multi-family dwellings and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, business structures, churches, hospitals, nursing homes, schools, or other structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis within 500 feet of the centerline of a transmission project of 230-kV or more.

²The data associated with paralleling 138-kV transmission lines includes an existing 69-kV transmission line that is being upgraded for operation at 138-kV prior to the completion of the Proposed Project.

³Apparent property lines created by existing roads, highways, or railroad ROWs are not "double-counted" in the length of ROW parallel to apparent property boundaries criteria.

⁴Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church within 1,000 feet of the centerline of the project.

⁵Only pipelines six inches and greater in diameter carrying petrochemicals were quantified in the pipeline crossing and paralleling calculations.

⁶As listed in the Chart Supplement South Central U.S. (FAA 2018b) formerly known as the Airport/Facility Directory South Central U.S.) and FAA 2018a.

⁷One-half mile, unobstructed. Lengths of ROW within the visual foreground zone of interstates, US and state highway criteria are not "double counted" in the length of ROW within the visual foreground zone of FM roads criteria.

⁸One-half mile, unobstructed. Lengths of ROW within the visual foreground zone of parks/recreational areas may overlap with the total length of ROW within the visual foreground zone of interstates, US and state highway criteria and/or with the total length of ROW within the visual foreground zone of FM roads criteria.

All length measurements are shown in miles unless noted otherwise. All linear measurements were obtained from aerial photography flown March, 2018 with the exception of high probability areas for archaeological historical resources which were measured from the USGS Topographic Quadrangles. The aerial photography was orthorectified to National Map Accuracy Standards of +/- 9 feet.

Table 4-2
Land Use and Environmental Data for Primary Route Evaluation (Primary Segments)
Primary Alternative Segments 10/05/2018

Evaluation Criteria	M2	N	N1	N2	O	O1	O2	P	P1	P2	Q	Q1	Q2	R
1 Length of primary alternative segment (miles)	9.1	19.4	11.0	6.0	7.8	6.0	4.1	6.2	9.9	2.8	7.7	1.2	3.4	13.4
2 Number of habitable structures ¹ within 500 feet of ROW centerline	0	0	0	0	0	0	0	5	0	0	0	0	0	0
3 Length of ROW using existing transmission line ROW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
4 Length of ROW parallel and adjacent to existing transmission line ROW	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0	3.2	0.0	0.0	11.2
5 Length of ROW parallel and adjacent to existing 345-kV transmission line ROW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
6 Length of ROW parallel and adjacent to existing 138-kV transmission line ROW ²	0.0	0.0	0.0	0.0	2.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
7 Length of ROW parallel and adjacent to existing 69-kV transmission line ROW	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	3.2	0.0	0.0	11.2
8 Length of ROW parallel and adjacent to other existing ROW (roadways, railways, etc.)	0.0	0.4	0.0	0.0	0.0	4.5	0.0	5.9	0.0	2.8	0.0	0.0	2.3	0.0
9 Length of ROW parallel and adjacent to apparent property lines ³	0.0	14.3	1.0	6.0	0.0	1.6	3.8	0.0	7.2	0.0	0.7	0.0	0.0	0.0
10 Length of ROW across parks/recreational areas ⁴	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
11 Number of additional parks/recreational areas ⁴ within 1,000 feet of ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	1	0
12 Length of ROW across University Lands	0.0	0.0	0.0	0.0	0.5	6.0	0.0	0.0	8.5	0.0	0.0	0.0	0.0	0.0
13 Length of ROW through cropland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
14 Length of ROW through pasture/rangeland	9.1	19.3	10.9	5.9	7.8	6.0	4.1	6.9	8.2	2.8	7.7	0.2	3.4	13.3
15 Length of ROW through land irrigated by traveling systems (rolling or pivot type)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
16 Length of ROW parallel and adjacent to existing natural gas pipelines (steel and 6" diameter or greater) ⁵	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.1	0.0	0.6
17 Number of pipeline crossings ⁴	0	12	1	1	3	0	0	22	2	1	4	0	0	18
18 Number of transmission line crossings	0	2	1	0	0	0	0	0	1	0	2	1	0	2
19 Number of IH, US, and state highway crossings	0	1	1	0	0	1	0	0	0	0	1	1	0	1
20 Number of FM road crossings	0	1	0	0	0	0	0	0	0	0	1	0	0	1
21 Number of cemeteries within 1,000 feet of the ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
22 Number of FAA registered public/military airports ⁶ with at least one runway more than 3,200 feet in length located within 20,000 feet of ROW centerline	0	0	0	0	0	0	0	0	0	0	0	1	0	0
23 Number of FAA registered public/military airports ⁶ having no runway more than 3,200 feet in length located within 10,000 feet of ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
24 Number of private airstrips within 10,000 feet of the ROW centerline	0	0	1	0	0	0	0	0	0	0	1	0	0	0
25 Number of heliports within 5,000 feet of the ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
26 Number of commercial AM radio transmitters within 10,000 feet of the ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
27 Number of FM radio transmitters, microwave towers, and other electronic installations within 2,000 feet of ROW centerline	0	0	0	0	0	0	0	0	0	0	1	0	1	1
Aesthetics														
28 Estimated length of ROW within foreground visual zone ⁷ of IH, US, and state highways	9.1	2.1	1.3	0.0	0.0	5.5	0.0	0.4	0.9	0.3	5.5	1.2	3.4	1.5
29 Estimated length of ROW within foreground visual zone ⁷ of FM roads	0.0	1.0	0.0	0.0	0.5	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	1.1
30 Estimated length of ROW within foreground visual zone ⁷ of parks/recreational areas ⁴	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.3	0.0	0.0	1.2	0.0
Ecology														
31 Length of ROW through upland woodlands/brushland	0.0	6.2	0.0	0.0	1.7	0.0	0.0	1.1	1.6	0.0	2.0	1.0	0.7	2.6
32 Length of ROW through bottomland/riparian woodlands	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0
33 Length of ROW across NWI mapped wetlands	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
34 Length of ROW across known habitat of federally listed endangered or threatened species	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
35 Length of ROW across open water (lakes, ponds)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
36 Number of stream crossings	3	2	3	1	3	1	1	1	0	0	2	4	1	1
37 Number of river crossings	0	0	0	0	0	0	0	0	0	0	0	0	0	0
38 Length of ROW parallel (within 100 feet) to streams or rivers	0.0	0.0	0.0	0.2	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
39 Length of ROW across 100-year floodplain	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Cultural Resources														
40 Number of recorded cultural resource sites crossed by ROW	0	0	0	0	0	0	0	0	0	0	0	0	0	1
41 Number of additional recorded cultural resource sites within 1,000 feet of ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
42 Number of NRHP listed properties crossed by ROW	0	0	0	0	0	0	0	0	0	0	0	0	0	0
43 Number of additional NRHP listed properties within 1,000 feet of ROW centerline	0	0	0	0	0	0	0	0	0	0	0	0	0	0
44 Length of ROW through areas of high archaeological site potential	2.4	1.7	1.8	0.8	2.2	2.1	0.8	1.2	0.5	0.8	3.0	1.1	0.6	2.8

Notes: ¹Single family and multi-family dwellings, and related structures, mobile homes, apartment buildings, commercial structures, industrial structures, business structures, churches, hospitals, nursing homes, schools, or other structures normally inhabited by humans or intended to be inhabited by humans on a daily or regular basis within 500 feet of the centerline of a transmission project of 230-kV or more.

²The data associated with paralleling 138 kV transmission lines includes an existing 69 kV transmission line that is being upgraded for operation at 138 kV prior to the completion of the Proposed Project.

³Apparent property lines created by existing roads, highways, or railroad ROWs are not "double counted" in the length of ROW parallel to apparent property boundaries criteria.

⁴Defined as parks and recreational areas owned by a governmental body or an organized group, club, or church within 1,000 feet of the centerline of the project.

⁵Only pipelines six inches and greater in diameter carrying petrochemicals were quantified in the pipeline crossing and paralleling calculations.

⁶As listed in the Chart Supplement South Central U.S. (FAA 2018b) formerly known as the Airport/Facility Directory South Central U.S.) and FAA 2018a.

⁷One-half mile, unobstructed lengths of ROW within the visual foreground zone of interstates, US and state highway criteria are not "double counted" in the length of ROW within the visual foreground zone of FM roads criteria.

⁸One-half mile, unobstructed lengths of ROW within the visual foreground zone of parks/recreational areas may overlap with the total length of ROW within the visual foreground zone of interstates, US and state highway criteria and/or with the total length of ROW within the visual foreground zone of FM roads criteria.

All length measurements are shown in miles unless noted otherwise. All linear measurements were obtained from aerial photography flown March, 2018 with the exception of high probability areas for archeological resources which were measured from the USGS Topographic Quadrangles. The aerial photography was orthorectified to National Map Accuracy Standards of +/- 9 feet.